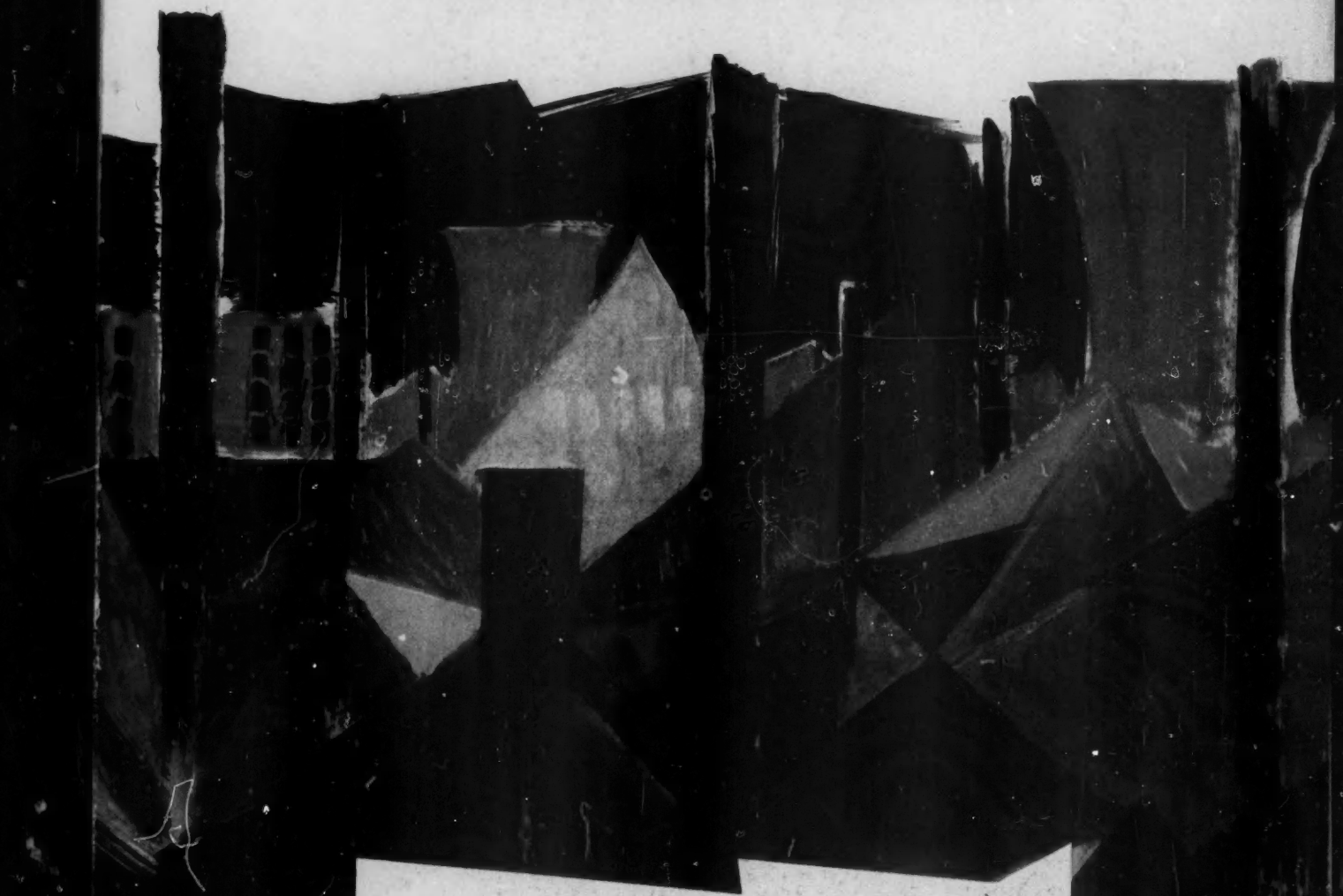
6 JULY 1961

ONE SHILLING
AND SIXPENCE

ELECTRICAL TIMES



A FACTORY NEEDS SECURITY

Security against constant breakdowns, motor burn-outs and damage to plant, the security given by safe, reliable switchgear that gives full protection. A factory needs

ELLISON
SWITCHGEAR

● Distribution Switchgear ● Motor Starters
● Circuit Breakers ● Fuse-Switchgear

GEORGE ELLISON LIMITED · PERRY BARR · BIRMINGHAM 22B

890

Wylex build quality into
20 amp Switches

Routine tests in the WYLEX laboratory continually prove production samples—*to many times the requirements of B.S. specifications.* In the picture, switches are being tested on full load, to over 400,000 make-and-breaks. In addition, rigid tests are applied for temperature rise, flash-over and mechanical reliability.

WYLEX 20 amp Switches (DP/AC) are available Surface All-Insulated in Brown or Ivory with or without the Pilot Light. Also supplied with or without moulded Pattress (enables compliance with I.E.E. Regulation 207 G.) Also Flush with All-Insulated Cover and Surface Metalclad with and without Pilot Light.

All switches feature silver-to-silver contacts, robust mouldings, sturdy mechanical components, and the extra WYLEX quality that costs you no more. Embossing 'WATER HEATER' at no extra charge. Also available at slight extra cost, 'FAN' 'HEATER' 'FLOOR HEATING'.

GEORGE H. SCHOLES & COMPANY LIMITED,
Wylex Works, Wythenshawe, Manchester 22.

Wylex build quality into...
SWITCH FUSE CONTROL UNITS
SPUR BOXES · COOKER UNITS
SWITCHES · PLUGS & SOCKETS

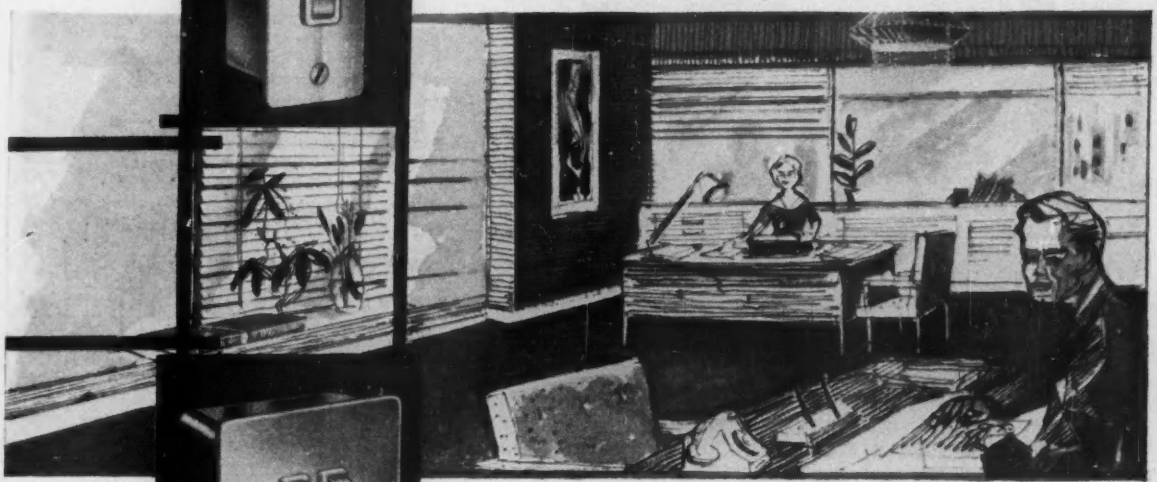
WYLEX

GEORGE ELLISON LIMITED · PERRY BARR · BIRMINGHAM 22B

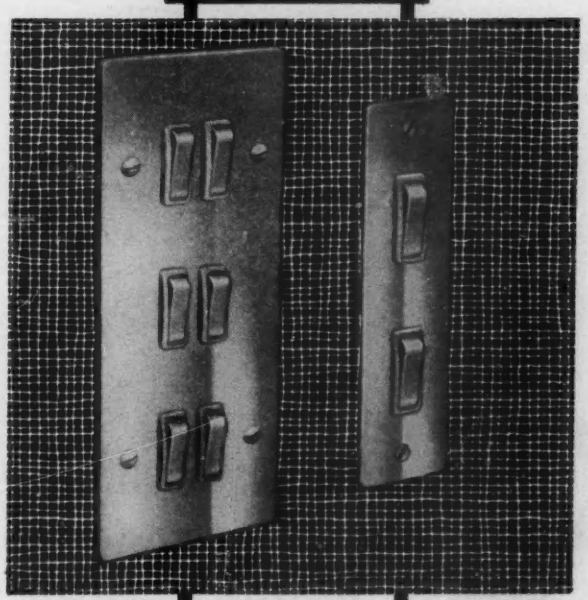
Walsall

"WAL-ROK"

SWITCH ASSEMBLIES



Modern Styling to grace any contemporary setting



The graceful lines of Walsall "Walrok" switches are styled to blend naturally with contemporary interior decor. Rated at 5/15 amps. Single pole, one and two way types being available, plate suspension only. Fitted to metal plates finished in our usual range of colours. Rocker bars being either metal or insulated. Boxes to BSS 1299 are for vertical assemblies 1, 2 and 3-gang. These switches are admirably suited for use as architrave pattern, Standard arrangement 1, 2 and 3-gang vertically in purpose made boxes.

NEWS ITEM

Shaver unit as illustrated
Write for details

SEND FOR NEWS ITEM PUBLICATION NI. No. 1

Name _____

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WALSALL | CONDUITS | LIMITED

EXCELSIOR WORKS, WEST BROMWICH, STAFFS
TELEPHONE: TIPTON 1171

A

NEW THORLUX THOROSEAL

Dust Proof Lighting Systems

make it easy to keep your lights clean. Hose the grime off without fear of water penetration. Smooth surfaces and sealed in toughened glass exclude all dust, vapours and fumes.
★ Integral cool mains connection box. ★ Quick release catches for relamping. ★ External accessories in Stainless Steel and corrosion resistant Cast body. ★ Easy maintenance and cleaning. ★ Available for a wide range of filament or mercury vapour lamps.
Contact F. W. Thorpe Ltd for full details.

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THROWS LIGHT ON INDUSTRY

WRITE FOR YOUR COPY OF OUR NEW CATALOGUE No. 1067 TO:-

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BICC M.I. CABLES

For lighting and power applications where a high factor of safety is essential

BICC Mineral Insulated Copper sheathed Cables are

Fireproof
Waterproof
Mechanically tough
Non-ageing

Off-the-shelf service from

CONDUIT DISTRIBUTORS LTD

ELECTRICAL WHOLESALERS

LEEKE STREET CORNER, KING'S CROSS RD., LONDON, W.C.1
Tele: TERminus 7842 (4 lines). *Grams:* Contube Kincross London. *Cables:* Contube London

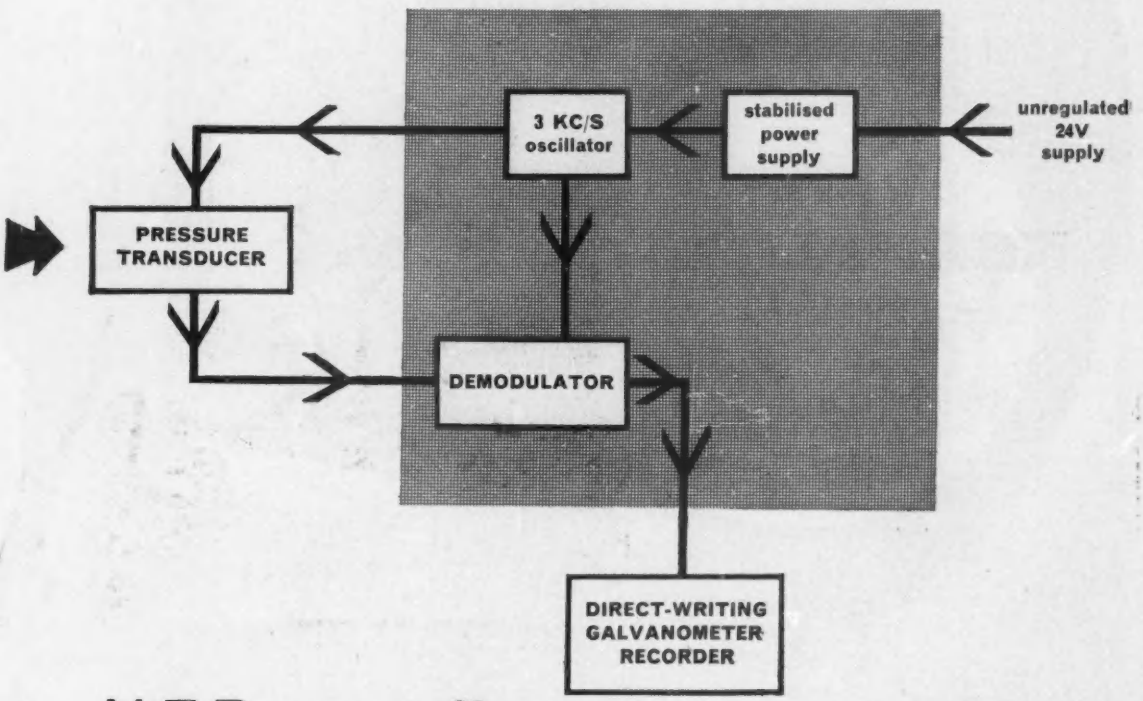
N.E.P. can now supply everything you need
to make a complete pressure measuring system:

* A 'Packaged' Unit consisting of
Stabilised Power Supply, Amplitude Stabilised Oscillator
and Phase Sensitive Demodulator.

* Direct Writing Galvanometer Recorders
with up to 36 Channels.

* The widest and finest range of
Inductive Type Pressure Transducers,
single ended or differential.

Please write for Specification Sheet No. A301



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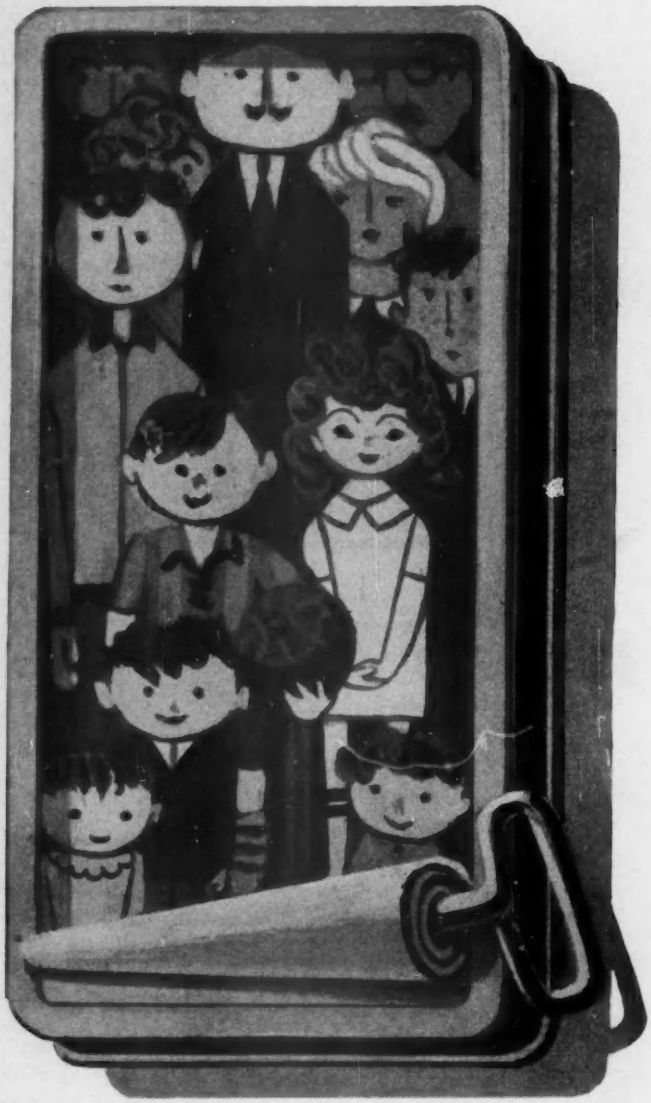
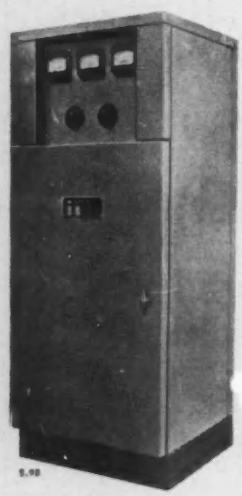


KEEPALITE

PACKS MORE IN THE SAME SPACE



Keepalite, the Chloride Company's automatic emergency lighting system, is now equipped exclusively with the new Chloride Planté cell which occupies only half the space previously needed by cells of the Planté type of equivalent capacity. Keepalite thus adds this important advantage to the many virtues that have made it the most trusted and widely used emergency lighting system in Great Britain. Despite its small size and light weight, the new cell is extremely robust and has all the great length of life associated with the Planté type of construction. As always, the advisory service of the Company's electrical engineers is at the call of electrical contractors and engineers who are interested in emergency lighting installation.

KEEPALITE

AUTOMATIC EMERGENCY LIGHTING EQUIPMENT

A PRODUCT OF CHLORIDE BATTERIES LIMITED - BACKED BY WORLD-WIDE SERVICE

Enquiries to : London, Elgar 7991 ; Bristol 664086 ; West Bromwich 2361 ; Leeds 20248 ; Glasgow, Bridgeton 3734 ; Manchester, Blackfriars 1158 ; Belfast 27953

in many ships
in many lines

PIRELLI-GENERAL SHIP WIRING CABLES ARE USED FOR MANY SERVICES IN THE *SS CANBERRA*

These cables are obtainable from G.E.C. Installation Equipment Group or direct from PIRELLI-GENERAL CABLE WORKS LTD.

PIRELLI GENERAL

best way to buy

Photo, courtesy of Skyfotos

PIRELLI-GENERAL CABLE WORKS LIMITED · SOUTHAMPTON & EASTLEIGH

P.6586

ONCE AGAIN!

A Coil Bobbin. Nylon A100M.
B Bearing Arm. Nylon A100M.
C Terminal Plate. Bakelite X20/5 H.D.
D Voltage Selector Knob. Nylon A100M.
E Starter Wheel. "Welvic" P.V.C. Medium Hard.
F Retaining Plate. Nylon A100M.
G Voltage Identification Plate. Melamine M4910.
The body is moulded from Melamine M4910 and the Head Guard (not shown) from Styrene Acrynitrile.

In 1959 we published a series of three advertisements giving details of our services in connection with the Sunbeam Shavemaster. The fact that we can now give details of the Sunbeam Rollmaster Electric Shaver speaks for itself.

It is interesting to note that shavers assembled from mouldings produced—and tooled—by us, are now being sold on the other side of the Atlantic.

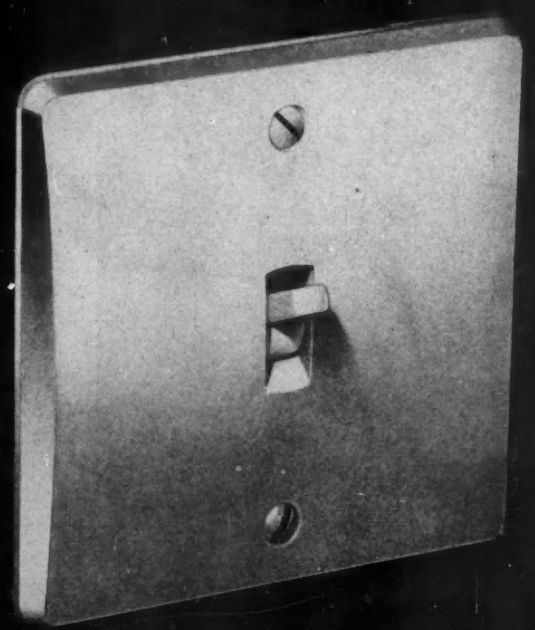
The new Sunbeam Rollmaster Electric Shaver is a superlative shaving instrument and incorporates mouldings in a wide variety of plastics. In fact the 22 mouldings involved required five different materials each selected to do a specific job. When quantity production to precise limits is required, and, particularly, when flawless surface finish is essential, we have the plant, resources and technical "know-how" to ensure complete satisfaction. May we quote for your next job?

Sunbeam choose E. Elliott Ltd

THE PLASTIC
MOULDERS WITH THE ENGINEERING
BACKGROUND

315 SUMMER LANE, BIRMINGHAM 19. Telephone : ASTon Cross 1156 (4 lines)

the switch that is silent...



that's the New Approach of G.E.C.

'MUTAC CLIPPER'

G.E.C. Installation Equipment Group have a *new approach* to switch design which serves to take the clicking out of switching.

If you listen hard enough you *may* just hear the discreet whisper of a 'Mutac Clipper'.

Furthermore, the *new approach* makes 'Mutac Clipper' switches unrivalled for ease and speed of assembly . . . ensures that these precision-made, electronically-tested switches give a guaranteed long-life performance.

G.E.C.'s *new approach* enables you to put one, two or three 'Mutac Clipper' switches in a standard BS1299 box. There's a choice of 44 different switch plates—in moulded plastic or metal—and 11 interchangeable units fit into just three different sized boxes:

5 amp 1 way S.P.
15 amp 1 way S.P.
5 amp 1 way D.P.
5 amp 2 way S.P.
5 amp 2 way & off
5 amp intermediate
5 amp 1 way secret
5 amp 2 way secret
Bell Push
Neon Indicator
Blanking Unit

'Mutac Clipper' switches cost no more than ordinary switches to buy and far less to install—that's a result of G.E.C.'s *new approach.* Complete interchangeability of 'Mutac Clipper' enables you to standardise right through a job.

INSTALLATION EQUIPMENT GROUP

***IMMEDIATE DELIVERY** of all 'Mutac Clipper' switches from wholesalers throughout the country. If you would like more detailed information, ask your wholesaler for 'Mutac Clipper' literature.*

When you specify Class H insulated motors you are taking a big step in reducing your maintenance problems.

Class H insulation has ten times the life of Class B insulation when working under the same conditions, so the risk of insulation failure—a major cause of motor breakdowns—is virtually eliminated.

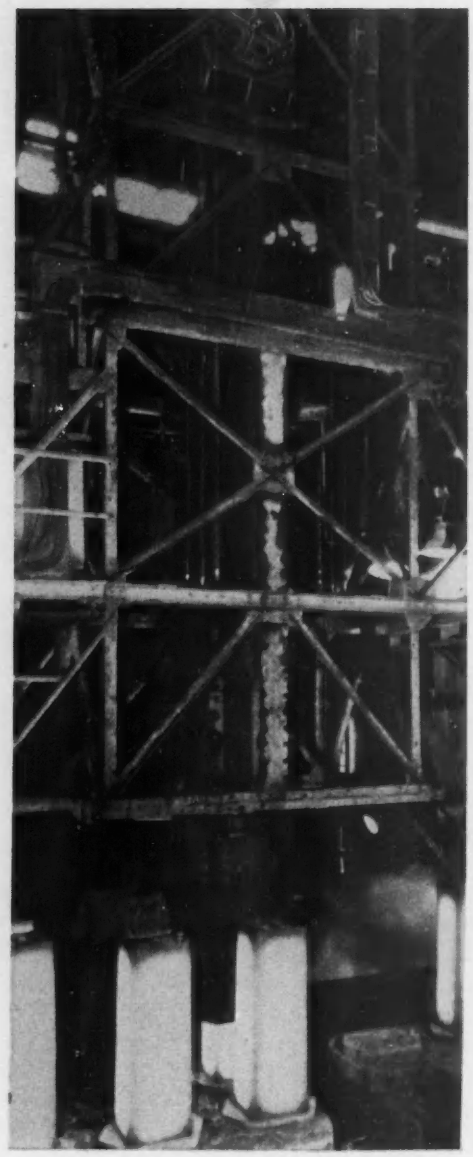
No matter how testing the working conditions, Class H motors will take the strain: you can safely subject your Class H motors to high humidity, scorching heat and heavy overloads. And it is often possible to choose a Class H motor of lower capacity than a Class A or B machine, because it is far more resistant to overload.

The advantages of Class H silicone insulation (to BS 2757) are by no means restricted to new machines. Many failing motors have been transformed into trouble-free units by a timely silicone Class H rewind.

Proved by tests: Continuous running tests have proved, that the insulation life of Class H motors outlasts both Class A and B insulation by *more than ten times.*

next time—try a Silicone Rewind

MS



CHOOSE THE MOTOR WITH H IN IT

£2,000 SAVED

with ONE Class H rewind

27 breakdowns in seven years. The cause? Insulation failure. The electric motor on a four-ton stripper crane at Workington Iron and Steel Company kept breaking down, so in 1953 the 50 hp Class A motor was replaced by a Class B insulated motor of the same rating specially designed for heavy duty—but there were still 5 insulation breakdowns over the next three years.

Because of production losses and the cost of rewinds the motor was finally rewound in 1956 with Class H insulating materials—silicones combined with glasscloth and mica.

Result? In the words of Workington Iron and Steel Company, 'No breakdowns since that date'. A saving of £2,000 in rewind costs with *no* further losses in production due to insulation failure.

These firms make Class H motors:-

Associated Electrical Industries Ltd · The English Electric Co. Ltd · The General Electric Co. Ltd · Bruce Peebles & Co. Ltd · Woods of Colchester Ltd · Brook Motors Ltd Lancashire Dynamo & Crypto Ltd · Brush Electrical Engineering Co. Ltd · Howells Electric Motors Ltd · Laurence, Scott and Electromotors Ltd.

Contact your nearest Midland Silicone area office; and ask for a list of rewinders who carry out silicone rewinds. Also ask for a copy of our news bulletin: 'MS News for Industry'.

MS

MIDLAND SILICONES LTD *first* in British Silicones

(Associated with Albright & Wilson Ltd., and Dow Corning Corporation)

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Area Sales Offices: Birmingham, Glasgow, Leeds, London, Manchester. *Agents in many countries.*

'HIDUTAC' switchfuses break 8 times their rated full load current

This high breaking capacity is made possible by cam-operated, silver contact, double-break "interruptor" units—just one of many 'Hidutac' exclusive features resulting from the *new approach* of the G.E.C. Installation Equipment Group to switchgear design. The *new approach* has crystallised from G.E.C.'s many years' experience of making switchgear superbly well.

Consider these other impressive advantages: *Unlimited full load switching*—'Hidutac' switchfuses operate at their full load current with unfailing reliability. *A unique compactness*, brought about by radial positioning of contacts. Generous wiring space and easy access to terminals at the front. *Total internal enclosure* of all moving parts, with shields over live terminals. *High fault current protection* in Single Pole and Neutral, Double Pole, Triple Pole and Neutral switchfuses with H.R.C. or rewirable fuses. Categories of duty are: H.R.C. fuses, all ratings, AC4 of BS88 (33000 amp); rewirable fuses, 15 and 30 amp ratings, S2A of BS3036 (2000 amp); rewirable fuses, 60 amp rating, S4A of BS3036 (4000 amp). *Modern styling* of pressed steel case with fully interlocked cover.

These exclusive features make 'Hidutac' switchfuses vastly superior for tungsten and discharge lighting control, motor control, and transformer and capacitor switching.

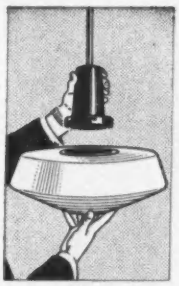
IMMEDIATE DELIVERY of 'Hidutac' switchfuses from wholesalers throughout the country. For more detailed information ask your wholesaler for 'Hidutac' literature.

that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP

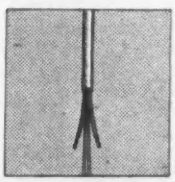
EXECUTIVE...

A new range of commercial lighting fittings, pendant and ceiling type, offering a wide choice of glasses, reflectors, skirts and suspensions, based on a quite small number of standard components. This is **EXECUTIVE** lighting, elegant, versatile and easy to maintain. Particularly suitable for offices, shops and stores, schools and public buildings.



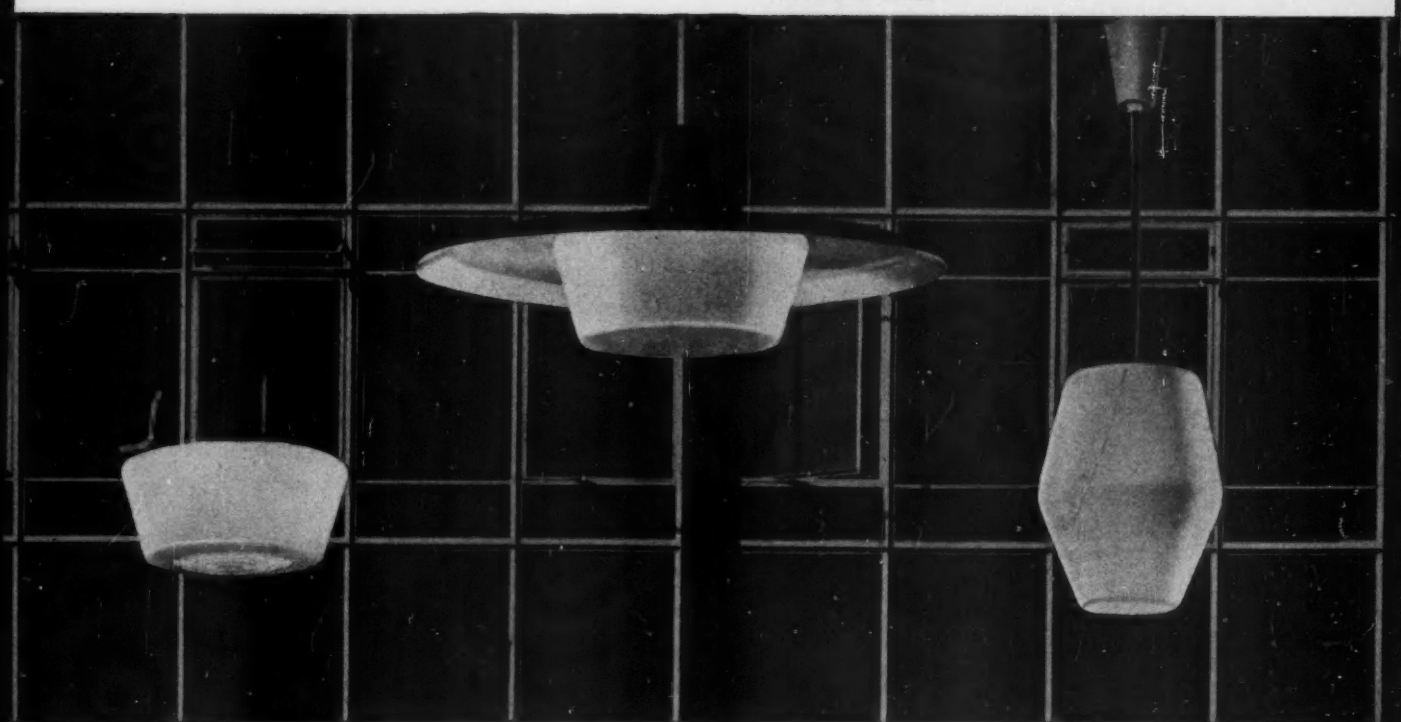
New simple 'TURN and LOWER' action for easiest ever installation and maintenance.

G.E.C's new positive bayonet fixing with 'turn and lower' action means EXECUTIVE glasses can be fixed or removed in an instant, saving time and money on maintenance and lamp replacement. (Patent applied for).



EXECUTIVE suspensions in ten different lengths are either ½ in. silver anodised aluminium tube or this new steel reinforced white flexible. (Patent applied for).

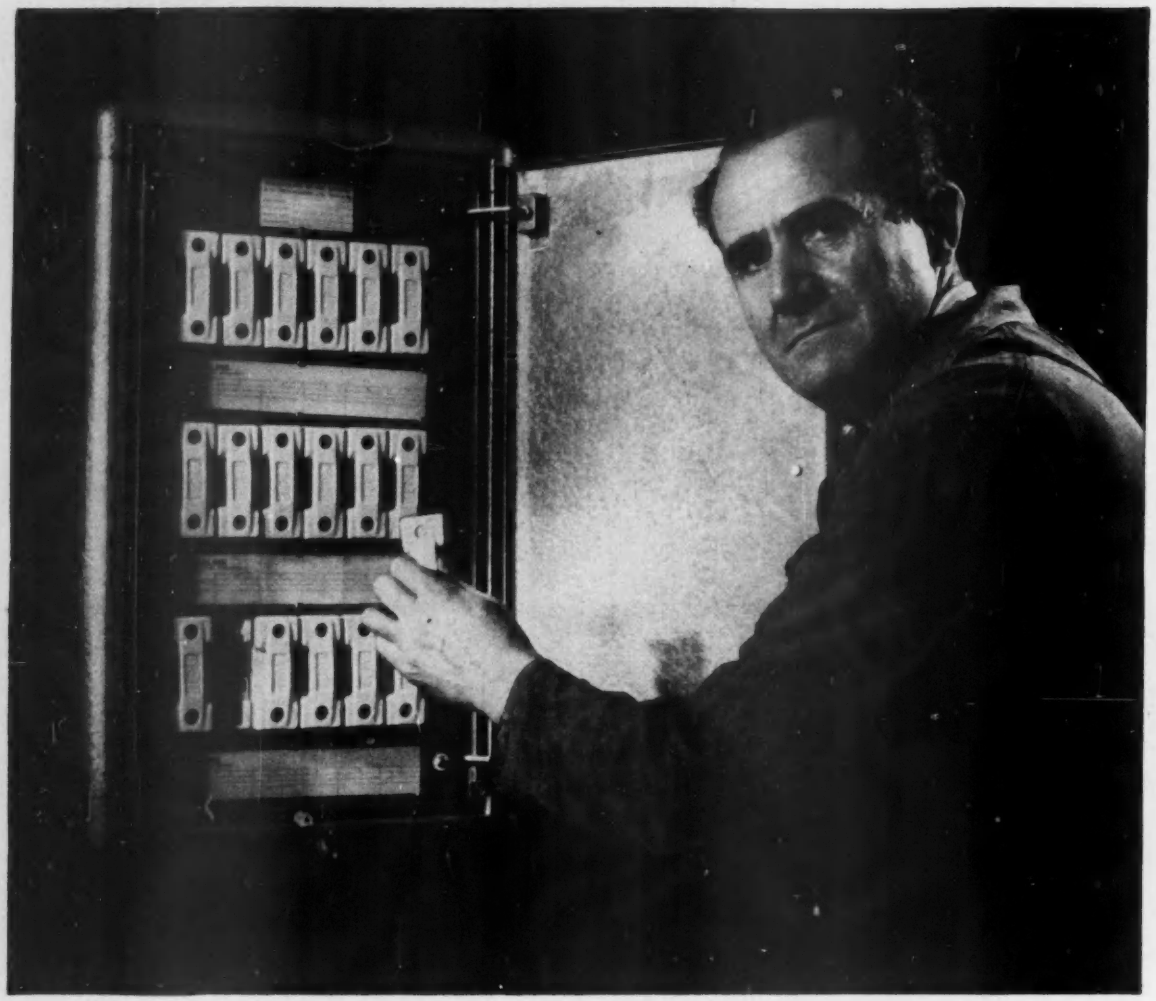
Internal locking screw on lampholder prevents unscrewing when relamping.



EXECUTIVE

G.E.C.

LIGHTING & HEATING GROUP, THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2



simply a matter of confidence

Ask any experienced electrical man. He'll tell you right away that you can have absolute confidence in anything Sanders make. No ifs, buts or doubts. If it's a Sanders job it's the best obtainable and it will never let you down. Take the SANDALINE Fuseboard, for instance, designed to meet today's modern requirements. With its ingenious smooth line case, detachable ends and sides, the 'Sandaline' has easily reversible fusebanks all making for ease and speed of wiring. Rewirable or H.R.C. Fuse Carriers can be fitted at will, since the 'Sandaline' has the tried and proved 'Sanda-speed' Duplex Fuse Units originated by Sanders. Absolutely rigid and dustproof, and incorporating a cylinder type lock with interchangeable keys, the 'Sandaline' Fuseboard is finished in steel-hammered grey stove enamel inside and out. But that's not all. It's a quality job. It's that little bit better than the best. In short, it's a Sanders job.

SANDERS

WILLIAM SANDERS & CO. (WEDNESBURY) LTD. - FALCON ELECTRICAL WORKS - WEDNESBURY - STAFFS.

NEWS SHEET

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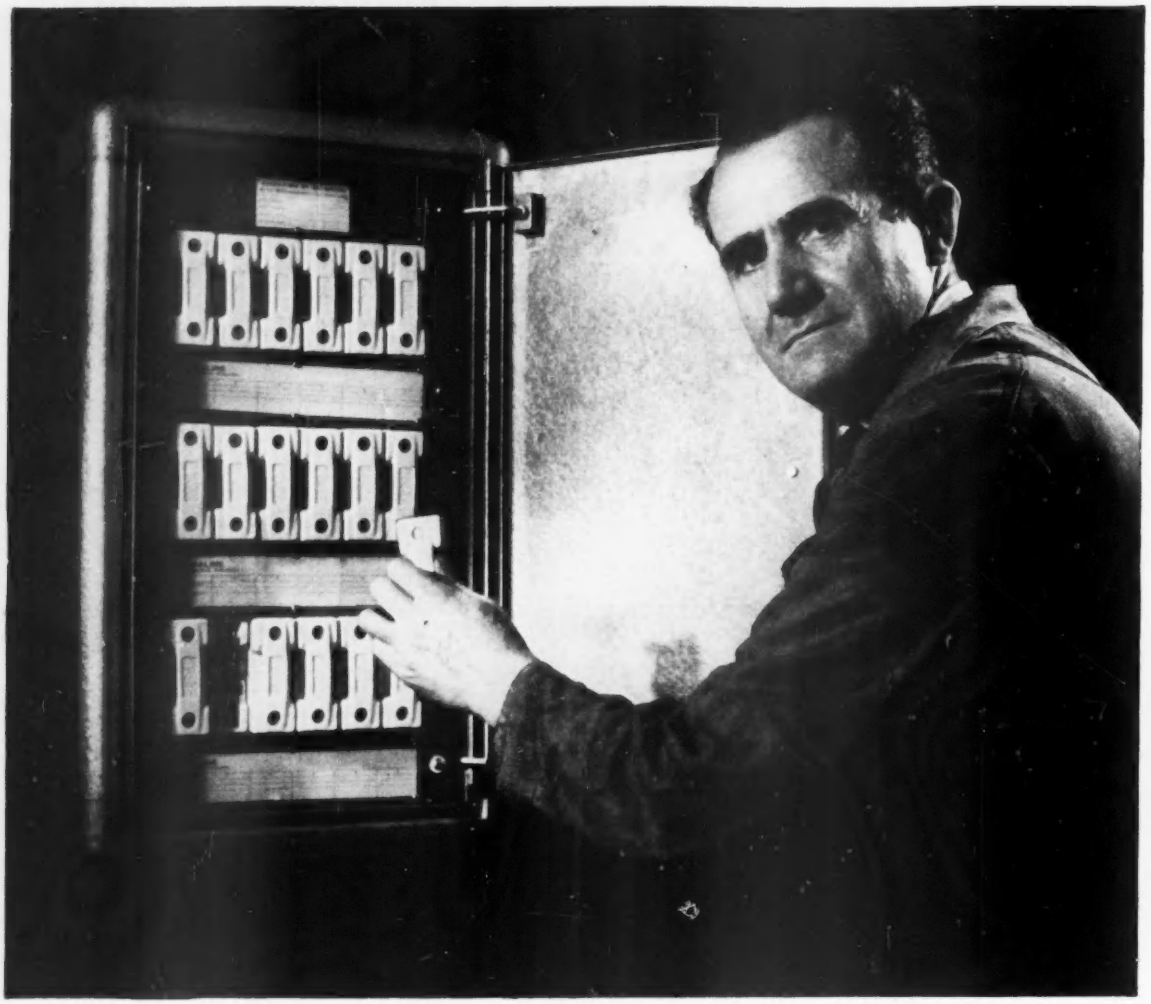

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NEWS SHEET

Network analyser and digital computer worked in combination by GEC for power system studies. Blackburn type analyser handles load flow, studies fault level and transfer admittance calculations. Computer fed with values from analyser, calculates swing curves, stability limit determinants, system loss studies. (2, 3)

Unnamed cable maker invites take-over. Small thermoplastics cable factory in London area offered in daily paper advertisement. (23)

First boiler positioned at Trawsfynydd nuclear station as third year begins. Work on 500 MW station well in hand; bottom of reactor pressure vessel in position, top under construction. (18)

Upper Borrowdale to have underground cables after all. Now N West EB not to adopt MoP scheme for short o.h. line section. (23)

Hungarian design for liquid-cooled alternator rotor seeks solution to problem of access to pipe connections for maintenance. (12)

Plea for semiconductor device price reduction by Sir John Cockcroft in opening Texas Instruments' new 132,000 sq ft factory. Universities need for computers hampered by high cost of components. (13)

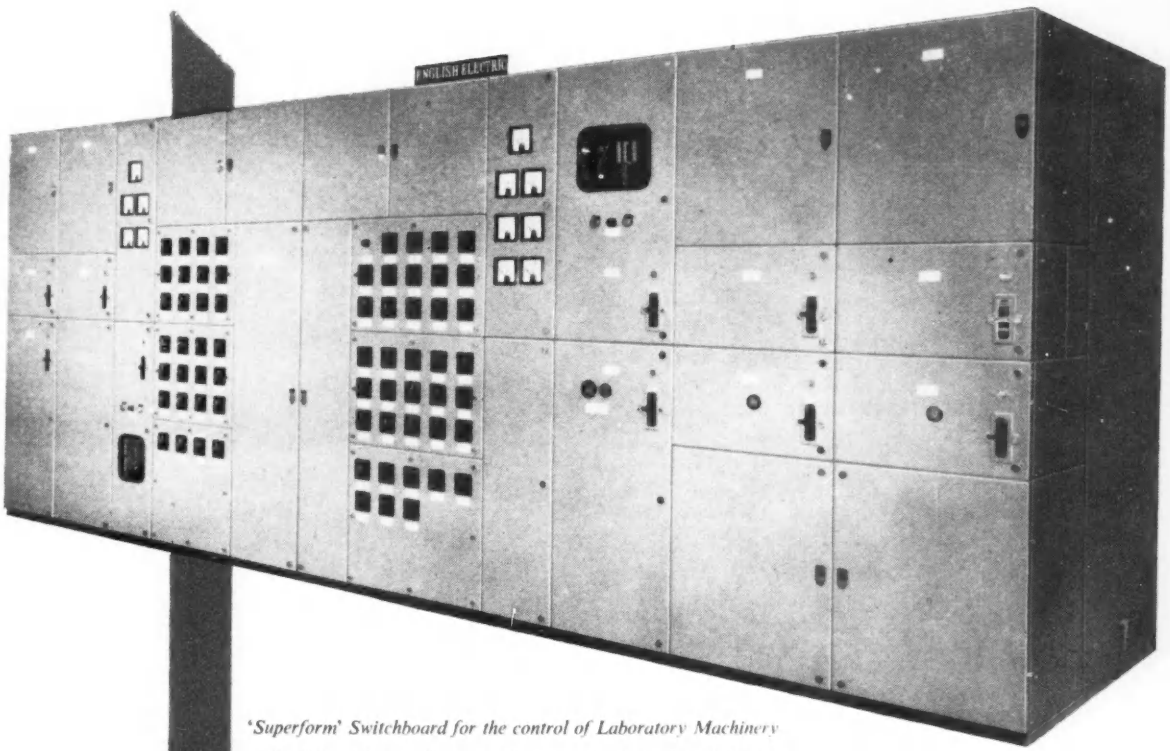
S Scotland EB push electrical off-peak central heating in booklet relating wide range of heating systems to their three off-peak tariffs. (28)

New materials and processes at Plastics Exhibition include thermoplastic with metal-like strength, and material similar to PTFE but easy to heat seal. Plastics conduit well in evidence. (8)

Quick and simple cable preparation for impulse testing uses resistive tape to give good voltage distribution. (12)

BUSINESS—Jackson Industries closing Luton cooker and refrigerator factory (23) . . . Liquidation recommended for Clydesdale Supply Co. (23) . . . Alwyn Holdings make one-for-two scrip issue and forecast 15% dividend . . . Superheater accept International Combustion takeover . . . Sterling Industries reject second Vokes bid . . . Pyrotenax add 5% jubilee bonus to dividend; propose one-for-three scrip issue . . . Better-than-expected results from Drake and Gorhan include one-third rise in profit and 17½% payment . . . With meter sales a record last year, Aron Meters negotiating to make cooker timers . . . Marryat and Scott lift dividend by 5% on record profit . . . Parkinson and Cowan profit drops from £281,184 to £47,648. (30)

OVERSEAS—Queensland propose two new power stations . . . BC Electric Co. increases interest in Peace River Co. . . . Algoma Steel Co. orders 25 MW power plant in Canada . . . Tasmania to build new h.e. station for aluminium plant . . . Electrical research lab. for Tokyo . . . Kalgoorlie EP and L Corpn. to cease generating at end of 1962. (29)



'Superform' Switchboard for the control of Laboratory Machinery at the Robert Gordon Technical College, Aberdeen. Supplied to the specification of W. P. Davie (now Davie and McCulloch) Consulting Engineer.

'SUPERFORM' SWITCHBOARDS

for all industrial distribution schemes

Composite boards can be supplied covering all the requirements of modern M.V. systems, the range of equipment including:

- Air circuit-breakers up to 3,000 amps.
- Off-load isolators up to 3,000 amps.
- Load-breaking fuse-switches up to 750 amps.
- Contactor gear for motor starting or other duty
- Distribution fuseboards
- Instruments, meters and relays of all types

Plus

- Modern styling and pleasing appearance
- Unique design features giving increased safety to operating personnel
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D

NEWS SHEET

Network analyser and digital computer worked in combination by GEC for power system studies. Blackburn type analyser handles load flow, studies fault level and transfer admittance calculations. Computer fed with values from analyser, calculates swing curves, stability limit determinants, system loss studies. (2, 3)

Unnamed cable maker invites take-over. Small thermoplastics cable factory in London area offered in daily paper advertisement. (23)

First boiler positioned at Trawsfynydd nuclear station as third year begins. Work on 500 MW station well in hand; bottom of reactor pressure vessel in position, top under construction. (18)

Upper Borrowdale to have underground cables after all. Now N West EB not to adopt MoP scheme for short o.h. line section. (23)

Hungarian design for liquid-cooled alternator rotor seeks solution to problem of access to pipe connections for maintenance. (12)

Plea for semiconductor device price reduction by Sir John Cockcroft in opening Texas Instruments' new 132,000 sq ft factory. Universities need for computers hampered by high cost of components. (13)

S Scotland EB push electrical off-peak central heating in booklet relating wide range of heating systems to their three off-peak tariffs. (28)

New materials and processes at Plastics Exhibition include thermoplastic with metal-like strength, and material similar to PTFE but easy to heat seal. Plastics conduit well in evidence. (8)

Quick and simple cable preparation for impulse testing uses resistive tape to give good voltage distribution. (12)

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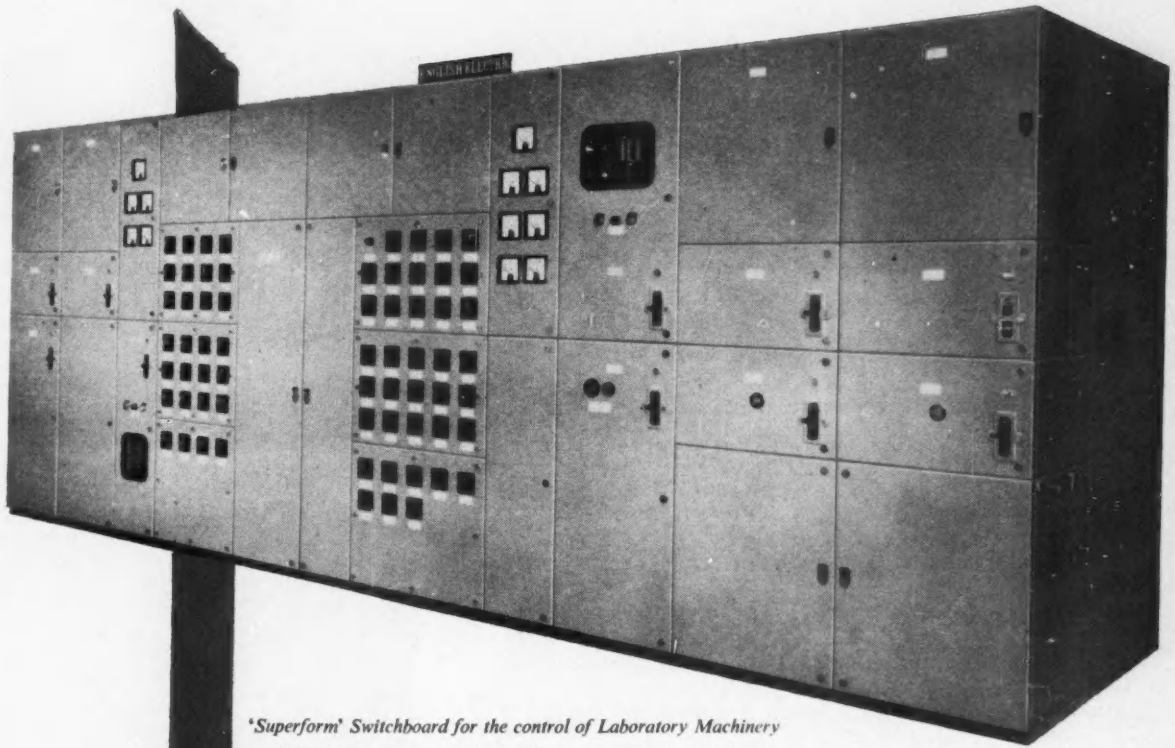

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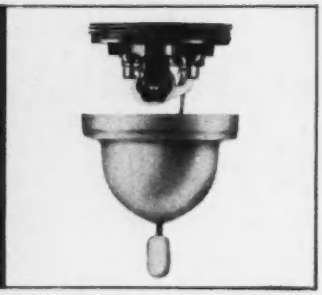
Overall cover protects rotary mechanism. Coil spring controls silver-faced contacts. Normal usage cannot put switch in inoperative position nor contacts in partial engagement. Nylon switch actuator. Recessed base; 2 in. fixing centres.



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5 amp. two way ...	...	List No. 2140 (Cream) 65/- per dozen
15 amp. double pole	...	List No. 2162 (Cream) 80/- per dozen

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J. A. CRABTREE & CO. LTD., LINCOLN WORKS, WALSALL, STAFFS.

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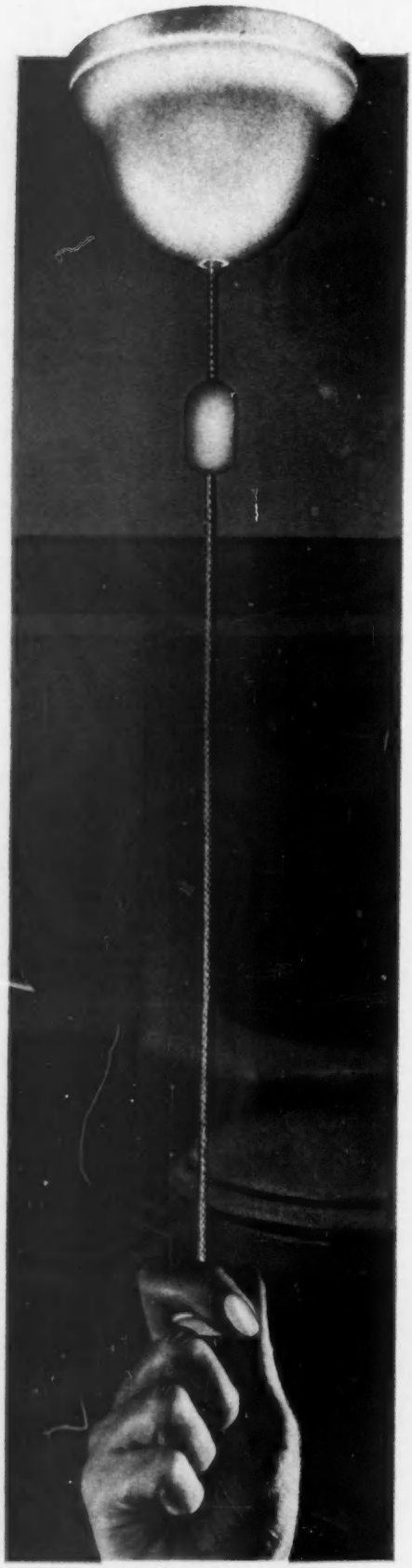

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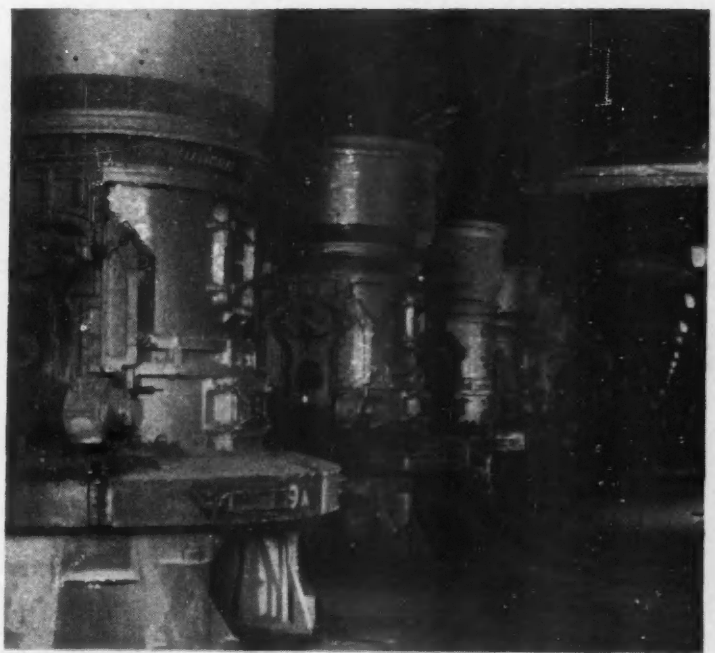
Continuous dust-free grinding of coal, gypsum, phosphate and many other materials can be carried out with the LOPULCO mill. This is just one example of IC processing equipment designed to meet the needs of industries as varied as quarrying, cosmetics, agriculture, steel and plastics. If you have a processing problem, no matter what your industry—write to IC about it.



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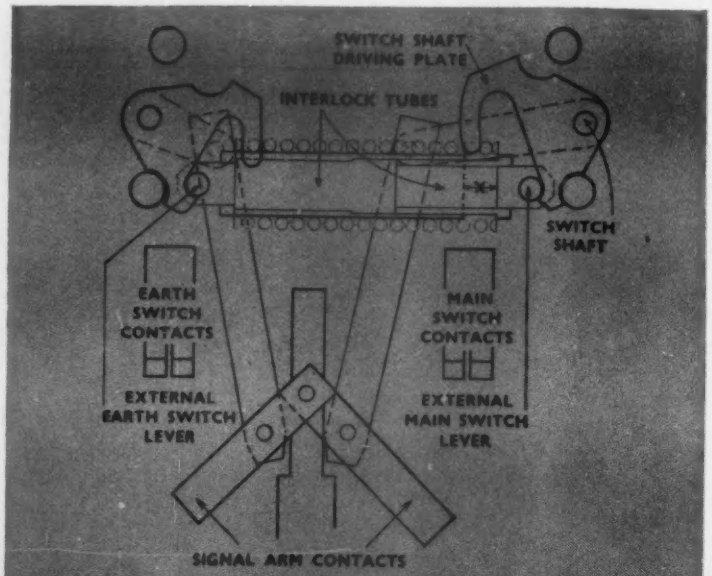

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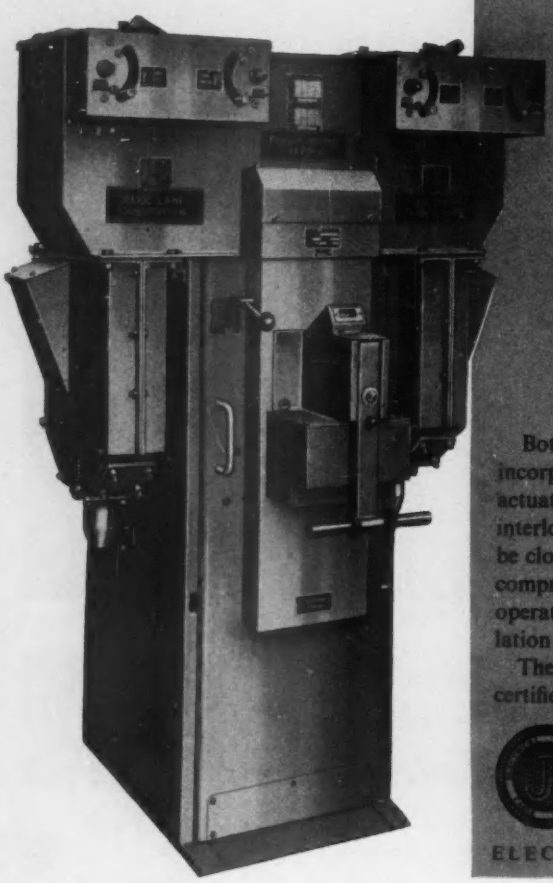

TYPE NX
RING MAIN UNITS
AND TYPE SX
OIL SWITCHES

for 6.6 kV systems up to 250 MVA and 11 kV systems up to 350 MVA

Both the Type NX ring main unit and the Type SX oil switch incorporate mechanisms with separate main and earth switches actuated by a common spring arranged to provide an integral interlock. This ensures that the main and earth switches cannot be closed at the same time. Operation of the switch, after initial compression of the spring, is entirely independent of the operator's speed and the hazards arising from hesitant manipulation are completely eliminated.

These mechanisms were incorporated in units, tested and certified to B.S.2631: 1955 at K.E.M.A. as far back as 1938.

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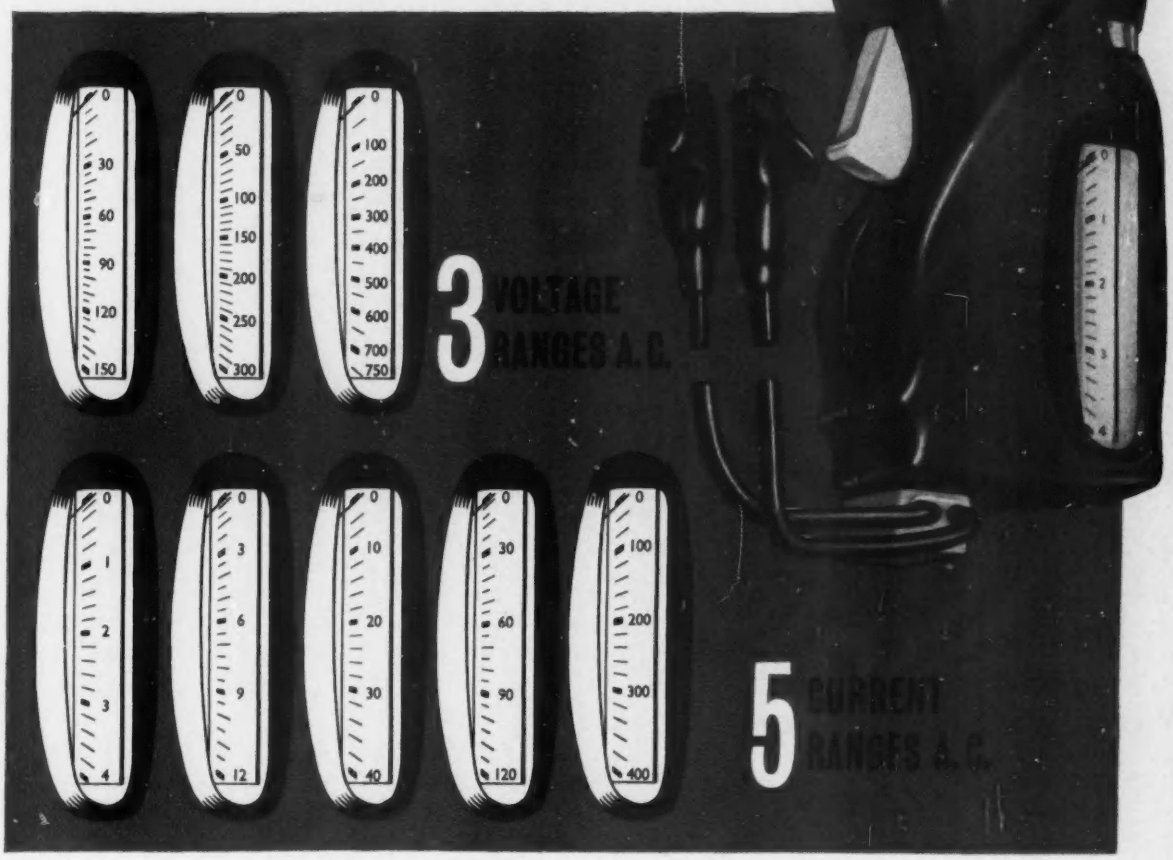
MINICLIP VOLT-AMMETER

8-Ranges

from this new versatile instrument



The Ferranti MINICLIP Volt-Ammeter extends the range of the well known Ferranti 7-Range Clip-on instruments and provides a pocket instrument of great versatility. Of modern design, the instrument gives easy, quick, single-handed operation. The thumb operated range selector switch selects the appropriate scale thus avoiding the use of multiplication factors. Eight ranges in all are provided comprising:
5 current ranges 0-4, 12, 40, 120 & 400 amps. A.C.
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For reliability and for the greater utilisation of space, printed circuit techniques have been used on the design of the MINICLIP, the new versatile instrument from Ferranti.

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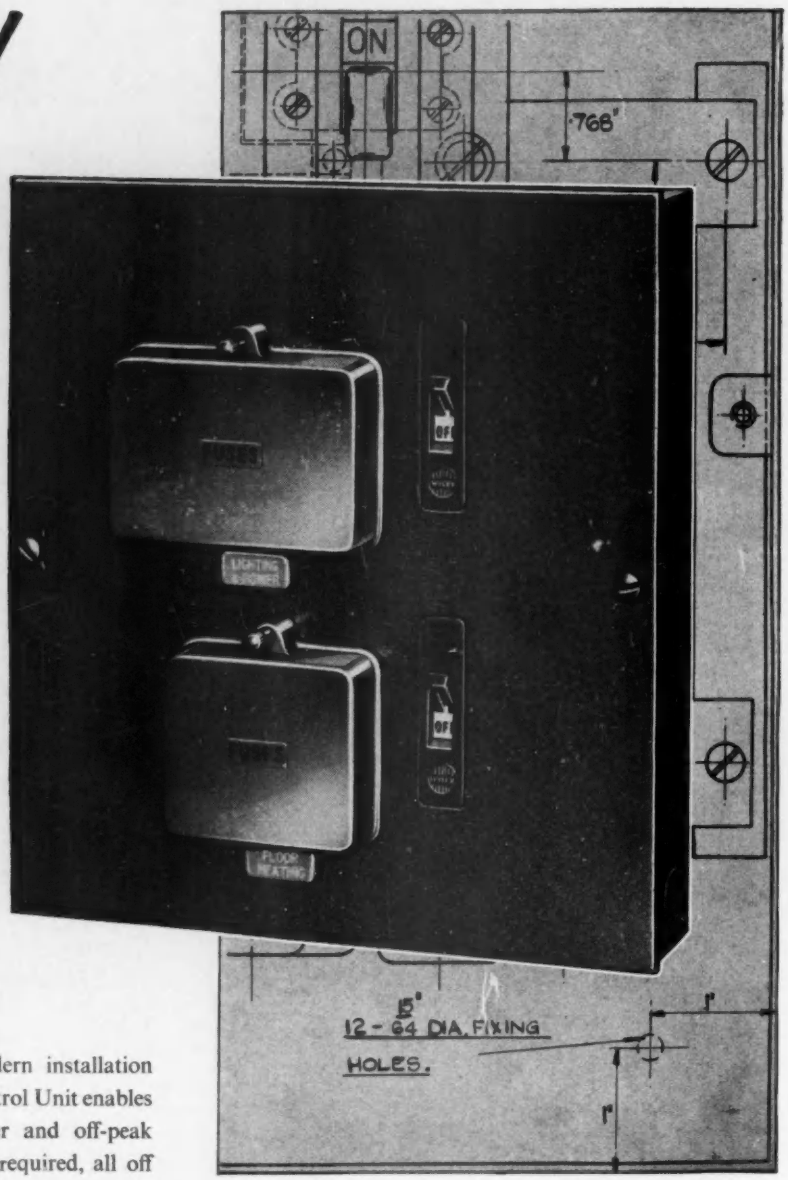
'M' Type Consumer Units



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Many combinations possible — ask us to supply you with particulars of the above 'M' Unit range.

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Manufacturers and Suppliers of
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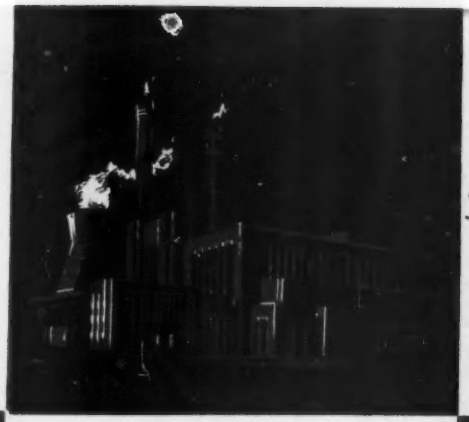
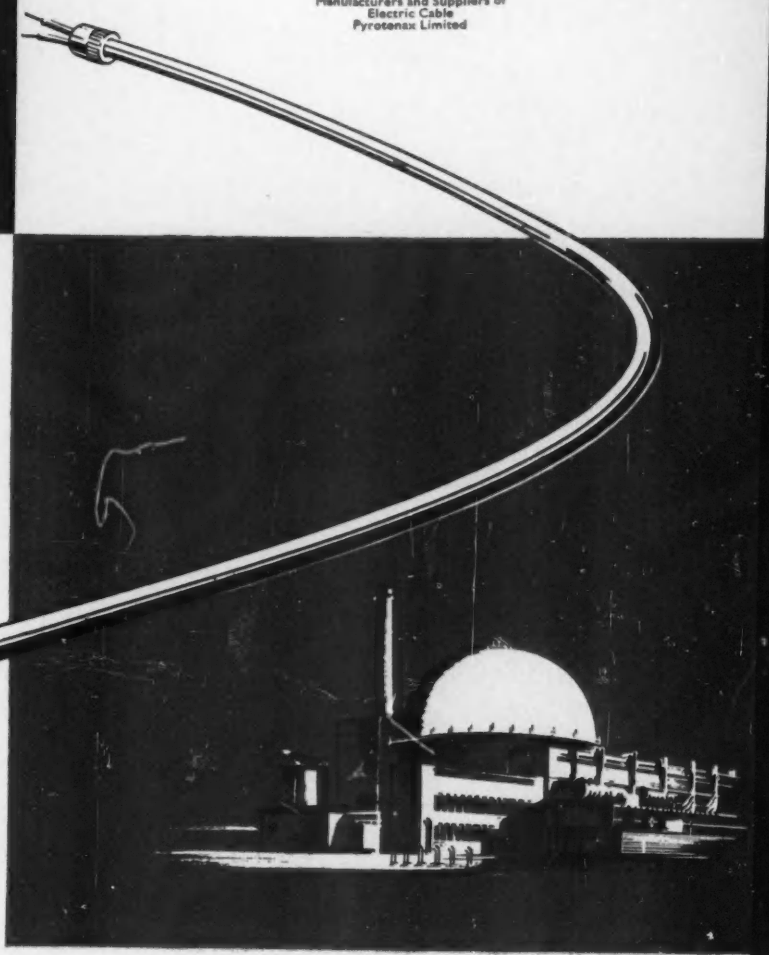
Pyrotenax Limited





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M.I. COPPER COVERED CABLE

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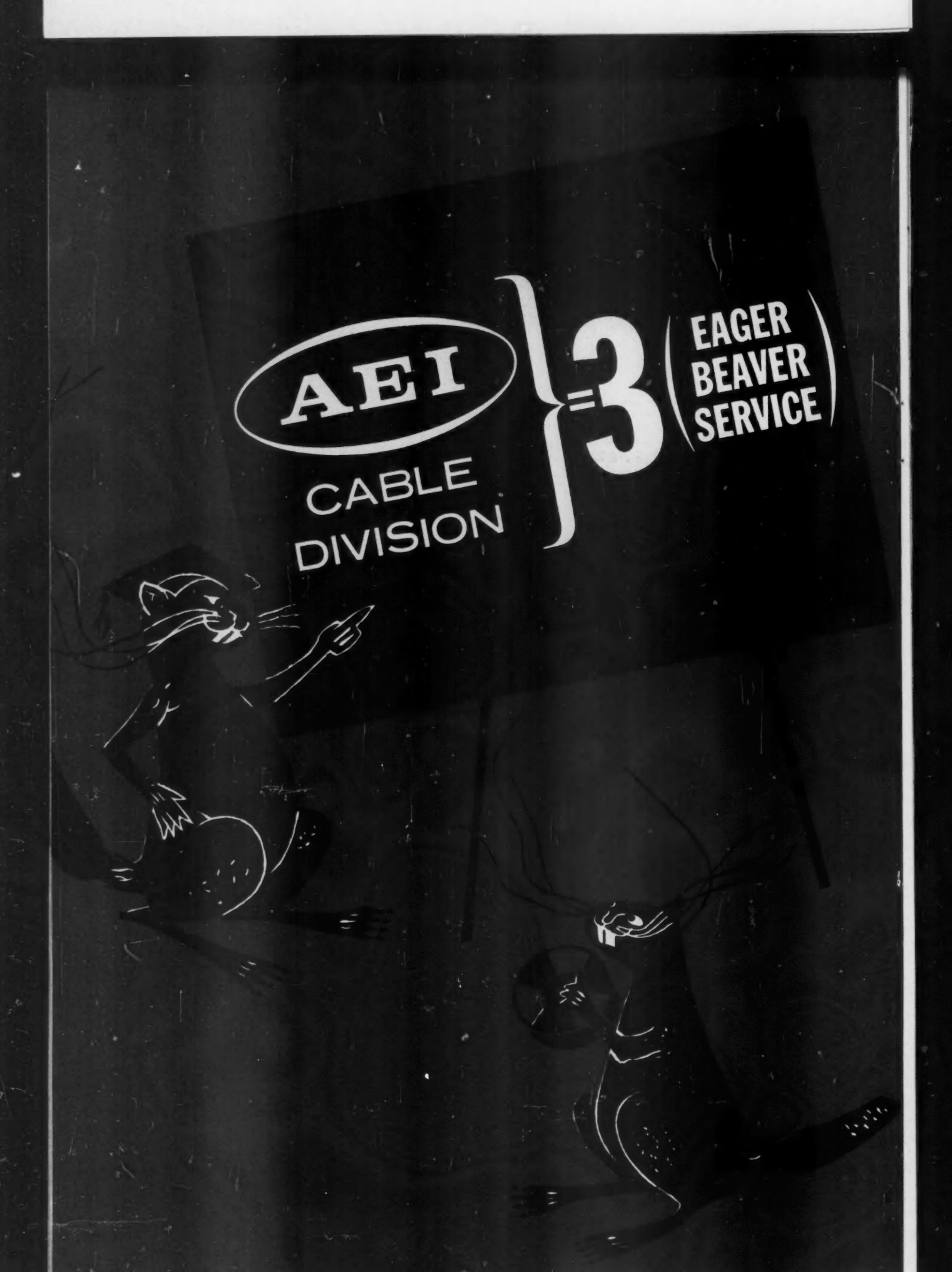
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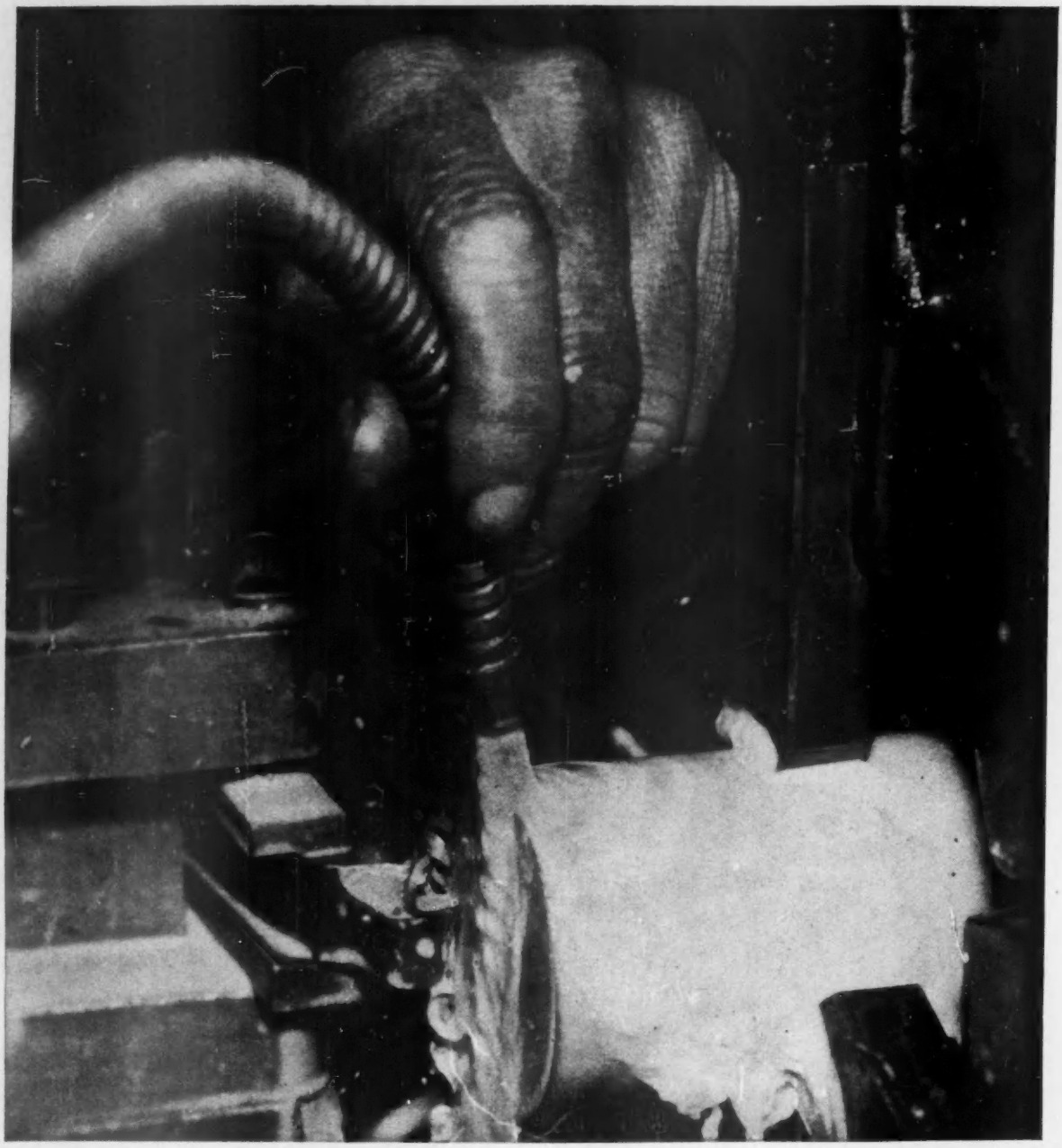
Shell achievement



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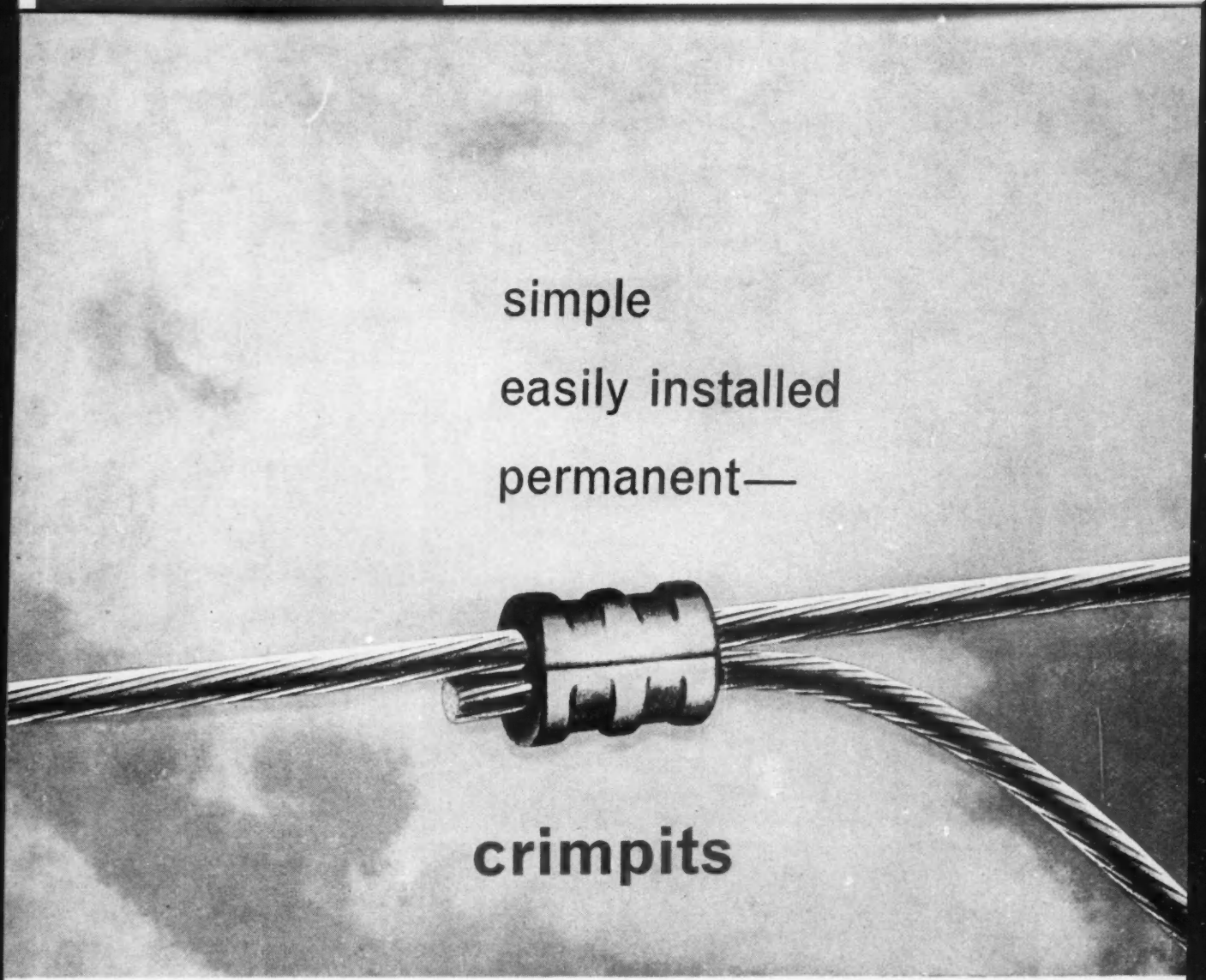

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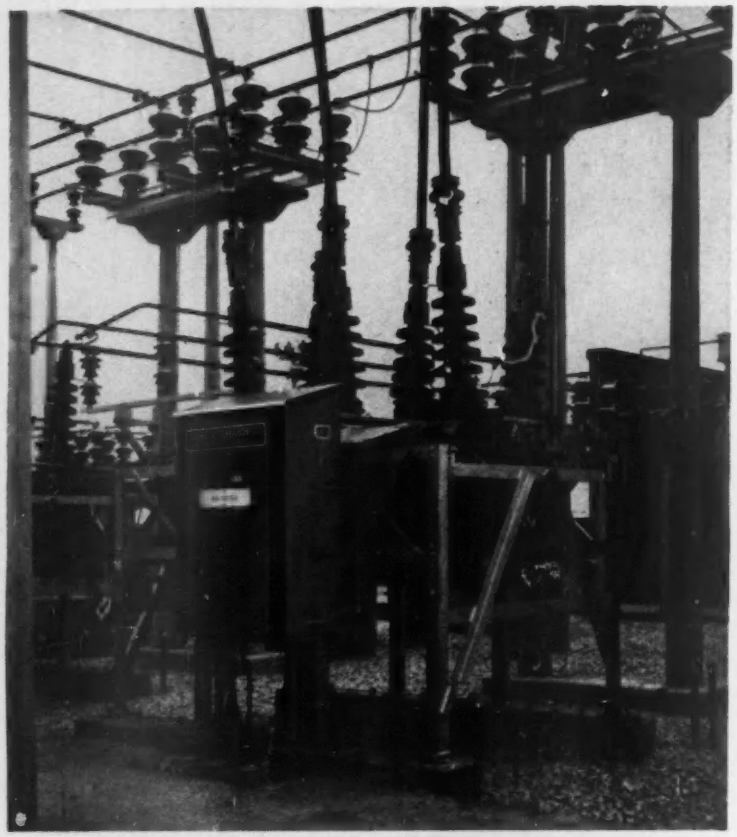

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...UP TO AND INCLUDING 66 kV

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IN ASSOCIATION WITH
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MAIN CONTRACTORS: A.E.I. Ltd.
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insulating KARIBA'S giant power 330 kV

All the bushing porcelains for the 330 kV. circuit breakers, all the 330 k.V. strain insulators for the substations, and the 330 kV. post insulators for some of the substations were supplied by

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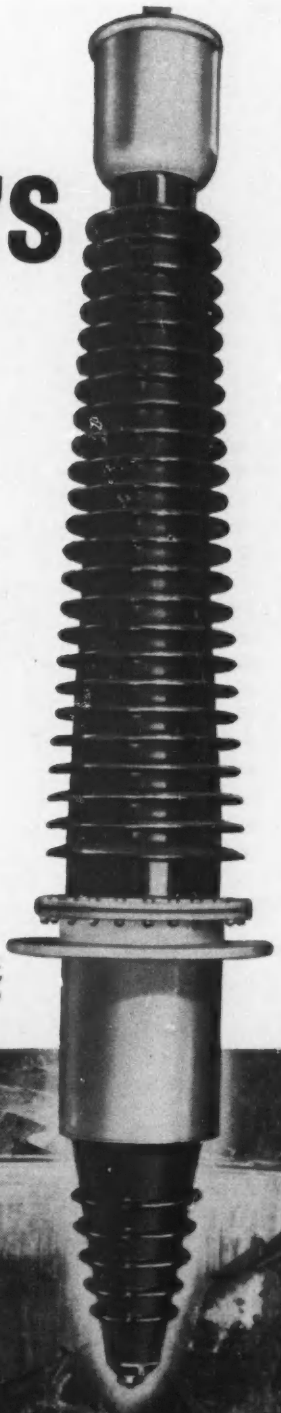
Units of the switch gear on the south bank. Power for the Copperbelt and for Southern Rhodesia passes through this stage.



A complete 330 kV. bushing insulator (by courtesy of A.E.I. Ltd.)

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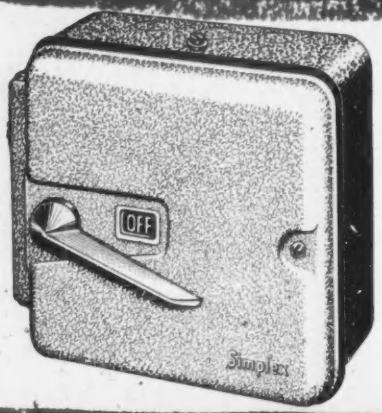
Simplex Star Switchgear

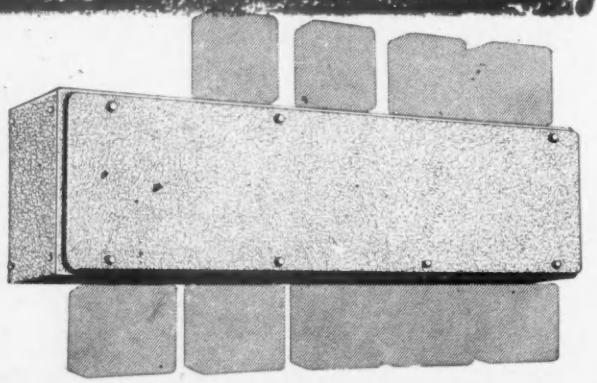


Simplex Star Switchfuse. Strong pressed steel case. Superbly styled.

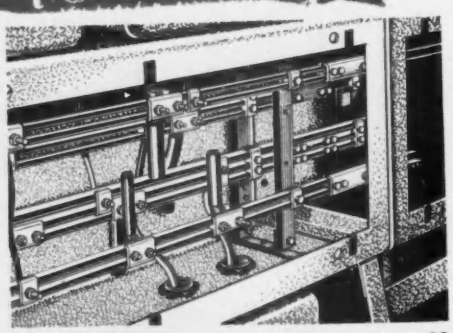
Star Switchfuse with cover open showing interior hinged forward for ease of wiring.

SWITCHFUSES AND BUSBAR CHAMBERS

Simplex were one of the first to develop a complete range of front operated switchgear. The advanced design is: remarkably simple to install and maintain · low in price, and completely safe. They are available in 15, 30 or 60 amp ratings, 500 volt A.C. or 250 volt D.C. The Busbar Chambers are available in 600 volt, 200, 400, 600 and 800 amp ratings · are readily extendable · have a high through-fault capacity · universal clamp connections — no drilling — no sweating. More details of Simplex Star Switchfuses and Busbar Chambers on request.



Star Busbar Chamber.



Close up of interior of Star Busbar Chamber showing main branch terminals, and busbar arrangements.

Cables cut away for purpose of illustration

S.2.

SIMPLEX ELECTRIC COMPANY LTD.
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Branches throughout Britain and Agents throughout the World

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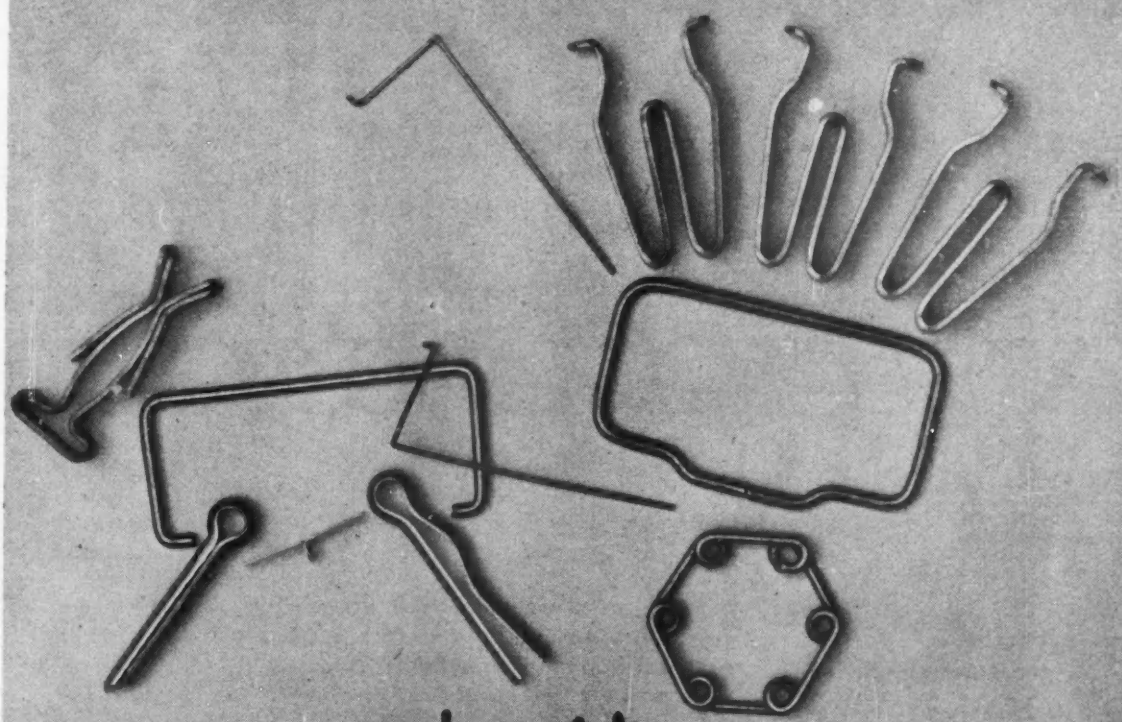

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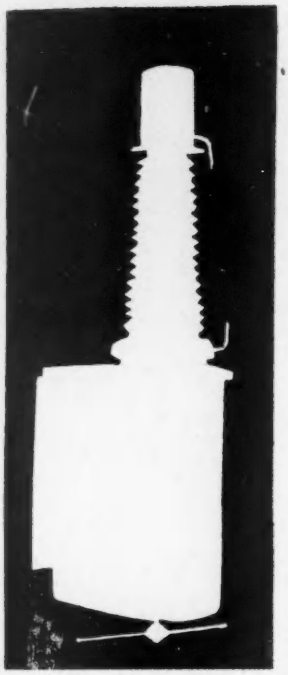
We not only make wire shapes precisely to specifications in practically any material we also manufacture parts in strip, and undertake spot welding.



FOR THE 400-kV GRID...

ANTICIPATION

AEI
to supply first Transformer On-load Tap Changers for Britain's new 400-kV grid

AEI was already engaged in designing the new transformer on-load tap changers before the C.E.G.B. actually announced its intention to uprate the supergrid to 400 kV. As a result the design of the new transformer on-load tap changers was already well advanced when the Board required this equipment.

AEI will supply two 3-phase sets of fully-insulated resistor transition on-load tap changers for connection at the 275-kV ends of the 400 MVA, 400/275-kV auto transformers to be installed at High Marnham and Monk Fryston sub-stations.

In every field of electrical achievement, anticipation keeps AEI ahead – and ensures that new design improvements are put into service quickly. Are you using this service?

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EA/101

THURSDAY 6 JULY, 1961
Registered as a Newspaper Volume 140 No. 1

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Analyse de systèmes d'alimentation 3

Pour la solution des problèmes relatifs aux systèmes d'alimentation, l'usage d'un analyseur de réseau du type analogique et d'une calculatrice numérique combinés présente certains avantages. Dans un des systèmes décrits, l'on se sert d'un analyseur de réseau du type conjugué ("Blackburn") ayant une précision inhérente de 0,1%. La calculatrice numérique sert à effectuer certains calculs subsidiaires, et remplacer l'analyseur pour le calcul des courbes d'oscillation du régime de l'alternateur, des limites de stabilité avec un contrôle régulier de la tension, et des pertes du système.

Matières plastiques pour le matériel électrique ... 8

Certains nouveaux matériaux plastiques que l'on peut utiliser dans les matériels électriques ont été exposés au salon annuel des matières plastiques tenu à Londres. Citons-en le "Delrin", dont les propriétés de résistance sont voisines de celles de certains métaux, et le film Acral, matériau semblable au PTFE qui de plus, peut être joint à la chaleur. Quant au traitement des matières plastiques, l'industrie électrique offrirait des débouchés au moulage au vide, procédé par lequel la feuille de plastique est tirée sous vide en form de moule femelle.

Centrale nucléaire de Trawsfynydd 18

Les travaux de construction de la centrale nucléaire de Trawsfynydd au Pays de Galles sont en cours d'exécution. Cette centrale aura un débit net de 500 MW. Les deux réacteurs nucléaires, modérés au graphite et refroidis au bioxyde de carbone, seront enclos dans des réservoirs à pression d'un diamètre de 18.6 m. La vapeur sera produite dans 12 chaudières, 6 pour cheque réacteur. Quatre turbo-générateurs de 145 MW seront installés.

In dieser Nummer

Kraftnetzanalyse 3

Bei der Lösung elektrischer Krafterzeugungsprobleme lassen sich durch die Verwendung eines Netzanalysators nach Art eines Analogrechners in Verbindung mit einem Ziffernrechner mancherlei Vorteile erzielen. Es wurde eine System beschrieben, in dem ein Netzanalysator vom konjugierten Typ ("Blackburn"-Analysator) angewendet wird, dessen Eigengenauigkeit 0,1% beträgt. Dem Ziffernrechner wird die Erledigung gewisser untergeordneter Berechnungen zur Aufgabe gestellt, und er ersetzt den Analysator bei der Berechnung der Generatorschwankungskurven, der Stabilisierungsgrenzen bei der Verwendung von Spannungsstabilisatoren, und der Netzverluste.

Plastik für elektrotechnische Zwecke 8

Auf der alljährlich abgehaltenen Londoner Plastikausstellung wurden einige neue Kunststoffe gezeigt, die sich zur Verwendung in elektrischen Geräten eignen. Sie umfassen das "Delrin", dessen Festigkeit den Eigenschaften einiger Metalle nahekommt, sowie Aclar-Film, ein dem PTFE ähnliches Material, das überdies durch Wärmeeinwirkung abgebunden werden kann. Bei der Verarbeitung von Kunststoffen scheint die Vakuumverformung, bei der die Kunstsoffplatte mittels Vakuum in eine Matrize tiefgezogen wird, für die elektrotechnische Industrie Zukunftswert zu besitzen.

Das Trawsfynydd Kernkraftwerk 18

Beim Bau des Trawsfynydd Kernkraftwerks in Wales werden gute Fortschritte gemacht. Dieses Werk wird mit einer Nutzleistung von 500 MW arbeiten. Die beiden graphitmoderierten, mit Kohlendioxyd gekühlten Kernreaktoren werden in Druckkammern von 18,6 m Durchmesser eingeschlossen sein. Die Dampferzeugung soll in zwölf Kesseln erfolgen, von denen sechs mit je einem Reaktor zusammenarbeiten. Vier 145 MW-Turbogeneratoren sollen Verwendung finden.

Modern Power System Analysis—Part 1 3
by K. C. Parton, B.SC.(ENG.), A.M.I.E.E.

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E.R.A. Creep Testing 11

Expanding Semiconductor Production 13

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SUBSCRIPTION RATES: United Kingdom £4, Overseas £4 10s per annum. Canada and USA $12 per annum. Subscriptions are payable in advance and may commence with any issue. Overseas subscriptions may be paid by banker's draft, cheque, international money order or credited to the Electrical Times Ltd., at Coutts and Co., 440 Strand, London WC2. Single copies price 1s 6d. Postage 6d.

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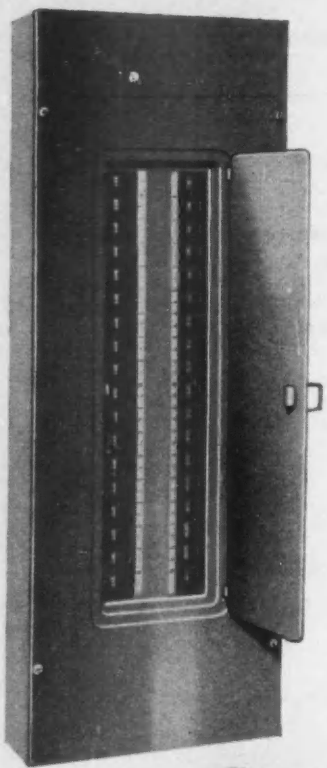

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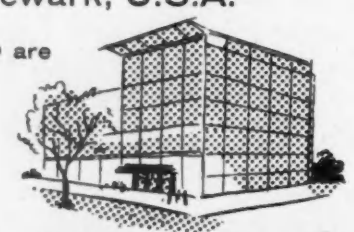

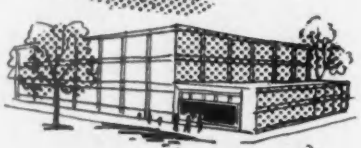

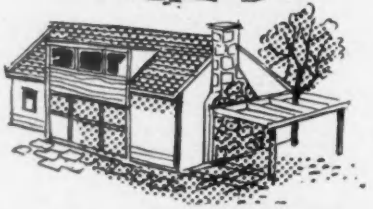

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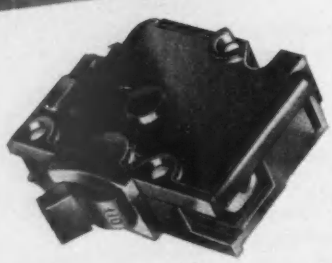

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 6 JULY, 1961

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T. W. WRIGHT

Comment

SAFETY CHECK FOR CONSUMERS

Consumers in two districts of the South Western area will soon be able to order a comprehensive check of their wiring and their electrical appliances for 30s. A pilot scheme along these lines is planned by the Board as a practical contribution to the improvement of electrical safety. To carry out an inspection covering as many features of the installation as the SWEB proposes—the details are listed in our news pages—is no small undertaking. Moreover, the legal liability attaching to the report on the testing, if it should fail to spot some dangerous condition, is something that no-one likes to accept. The more, then, the public-spiritedness of the Board in making available a service of this description. It tackles the safety problem at a point where the widespread activities of the NICEIC make hardly any impact, the installation of some years' standing. It will be no easy matter to get the general body of consumers to use this new facility, because they will be more fearful of what faults revealed may cost them than of the cost of the testing itself. However, the sort of publicity that has made people conscious of the NICEIC works as well to encourage some interest in the periodic testing envisaged in IEE Regulation 511. Ready availability of a moderate-priced testing service may clinch the point, to the benefit of all concerned. The experiment is one to be watched closely by the electrical industry generally in the hope that it will prove a major success.

MORE DATA ON CREEP

The creep laboratories of the Electrical Research Association, which are to be opened formally today, provide a reminder that the Association's service to the electrical industry is not confined to matters of obvious electrical importance. That the ERA should be providing the centre for the large expansion in the country's creep-of-steel testing facilities is an indication of how central this question is to electricity supply and of how co-operation in research can economically provide information for a wide sector of industry. The new laboratories have been paid for jointly by the supply industry, the steel industry, generator manufacturers, boilermakers and pipemakers. All will benefit from results in a field where, partly because of the time-consuming nature of the tests, it is generally admitted that too little work has been carried out. Speaking with the authority of Central Electricity Generating Board membership, and of specialist experience in metallurgy, Mr L. Rotherham has forcibly made the point that much more test data is needed to make the most efficient use of materials

in accordance with established design theory. As sizes of generating sets increase, and the temperatures and pressures used in power stations climb in the interests of better thermal efficiency, the need for designing closer to the abilities of the materials used becomes greater. The extensive laboratories at Leatherhead, with their provisions for highly accurate work on a large-scale basis, seem well calculated to make an important contribution in this respect. They should add to the high reputation for practical contribution to engineering advance that the ERA already enjoys.

VERSATILITY IN POWER SYSTEM STUDIES

Arguments for and against digital computers as the sole tool for power system analysis have been discussed in these columns on several occasions. Despite the enthusiasm of many engineers closely associated with computer development, there remains a strong feeling apparent amongst those most closely connected with power system studies that the network analyser has a lot of life before it yet. As so often in engineering, development has reached a stage where a compromise is attractive, with analogue and digital machines used in close collaboration. The article that begins opposite sketches the way this has been worked out in the GEC organisation, where possession of a Blackburn-type network analyser with facilities for direct display of measured quantities in digital form makes joint working with a computer relatively straightforward. For some network analysis tasks the computer is unrivalled, as for swing curve calculations for systems with a large number of machines, but also for a number of subsidiary but essential mathematical tasks. On the other hand, there are some system conditions to which the computer is unrealistically insensitive. It will churn out an answer, but it will not indicate the "ill-conditioned" nature of a system, its razor-edge balance and closeness to minor instabilities, in the same way that an analyser study will make it apparent to operators striving to obtain a balance. All this seems to hold a lesson for those who talk of computers built into the control arrangements for large power systems. It does seem that if compromise in application is forced even in the design calculation stage, then it may be premature to talk of computers being used to initiate preventative or corrective action in operating systems.

ELECTRICITY AFLOAT

Although it is some little time since Lloyd's Register of Shipping amended the rules for electrical installations in ships, only recently have we had an opportunity of studying the revised document. The new rules represent a considerable tidying up of regulations which have existed in some form since 1894 and which had their last thorough overhaul in 1933. The Lloyd's rules claim only to cover those features of the electrical installation which are essential to the safety of a ship. Other electrical characteristics are dealt with only by the requirement that they must comply as a minimum with the appropriate national code, such as the IEE Regulations for the Electrical Equipment of Ships. Within their scope, the new rules are detailed enough. They need to be when the basic requirement for the equipment is efficient operation under the lively conditions (to a land-bound mind) of a "ship inclined from the normal at any angle up to 15° transversely, when pitching 10° longitudinally and when rolling 22½° from the vertical." Within the care needed to meet these and other characteristics of sea service the new rules recognise a number of modern trends, notably in the matter of machine ratings and of acceptable cable dielectrics—although paper insulation is proscribed. There is also noticeable some relaxation about the necessarily severe restrictions on installation details in tankers away from the tank spaces. A rather tart comment extra to the rules proper notes, however, that flameproof construction is not acceptable in the more dangerous parts of such ships because "flameproof equipment is flameproof when it leaves the manufacturers' works and after a period of service may no longer be flameproof, due to faulty or inadequate maintenance." That, perhaps, reflects the realism of the new document better than most extracts could.

CENTIGRADE ASCENDANT

Amongst the oddments of information which emerged from the Electrical Forum session at the recent BEPC was a warning to engineers to brush up their memories of Centigrade Heat Units and to prepare to abandon B.Th.U. The CEGB, it was announced, intends to change from the Fahrenheit temperature scale to the Centigrade. Little more information than that is available at present, but the change can be recognised as finding its way in through the side door of nuclear technology. In nuclear station design, the physicist-dominated core calculations right through to the cooling gas temperatures have commonly been expressed in degrees C. Transmutation to the more familiar Fahrenheit comes with the change from gas to steam in the station heat exchangers. Once established, Fahrenheit has held its accustomed sway throughout the turbine house. Now it seems probable that this will alter, although there may be some negotiations to be gone through with plant manufacturers before the alteration is made fully effective. That will mean some new sets of "typical" values for engineers to memorise; but for the present, at any rate, it seems that the CEGB are not going the whole metric hog. They are staying clear of kilogrammes and the metric tonne. Yet might a change from klb/hr to Imperial long tons/hr in steam measurements pave the way for a relatively painless shift there for back-of-envelope calculations, because of the fortuitous approximation of ton to tonne?

Meteor

This week's quick summary of electrical news faces advertisement page 12

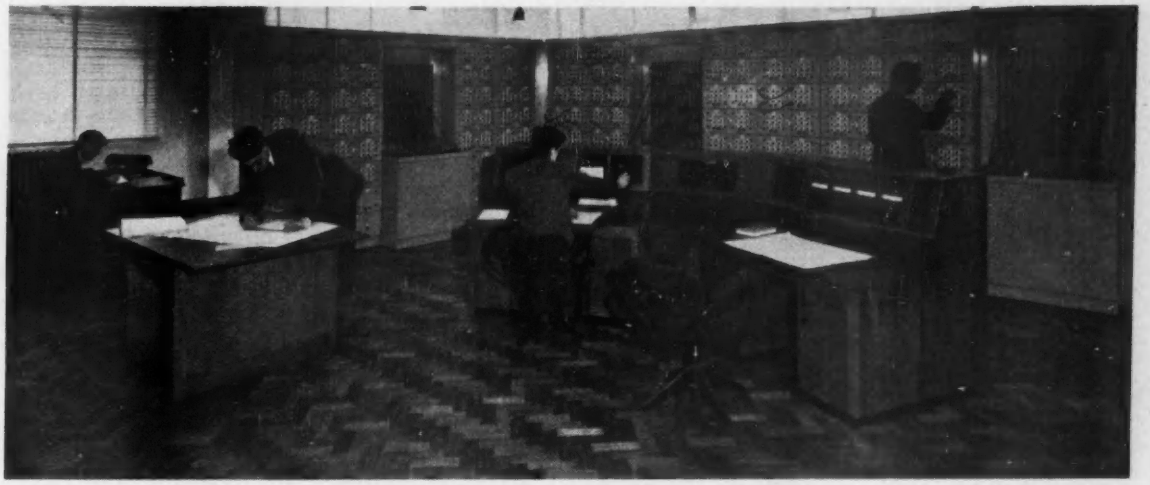


Fig. 1. General view of analyser room at Witton showing Blackburn-type analyser

MODERN POWER SYSTEM ANALYSIS

Part 1—EQUIPMENT AND TECHNIQUES by K. C. Parton, B.Sc.(Eng.), A.M.I.E.E.*

THE high capital costs of transmission and distribution systems, particularly e.h.v. transmission, make it essential to choose a final system that is the most economical and, where possible, planned from the outset to meet the continual growth of load and generation. To ensure this, major questions such as choice of voltage, thermal loading, and voltage and synchronous stability under normal and fault conditions have to be studied in great detail.

Two articles from the GEC Engineering Computer Services Dept, of which this is the first, have been prepared to show how the advantages of network analysers and digital computers are being combined to carry out this work as efficiently as possible. The first gives a brief survey of the equipment and techniques that have been developed, and the second article gives detailed examples of how these techniques are applied.

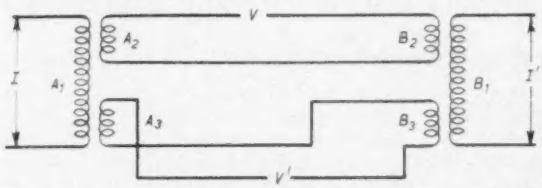


Fig. 2. Two "ideal" transformers interconnected to simulate a complex quantity

In the author's organisation, all types of power system study were initially carried out on a large Blackburn-type network analyser, but as digital computers have become available so various items have been economically transferred to the digital computer. This has resulted in many applications where a combination of network analyser and digital computer applications has proved most effective. The Blackburn-type network analyser is a rather special analogue type of machine, including digital-type self-balancing bridge metering facilities, and is very convenient for obtaining results suitable for feeding directly to a digital computer. The analyser is inherently of high accuracy, and this feature makes the combined use practical by avoiding any inequalities when transferring analyser readings to the digital computer for further analysis.

Before summarising the present work, therefore, a brief description of the present analyser and digital computer techniques used will be found helpful.

Network Analyser Facilities

The network analyser described was commissioned in the summer of 1958 and was the first full-size analyser in the world to operate on the transformer analogue principle. This is basically different in principle to the miniature component principle used in conventional or conjugate type network analysers, although externally and from the operating point of view it is the same. The general arrangement is as shown in Fig. 1.

Basic principles. In this analyser, ideal voltage transformers are used to represent any positive or negative resistance, reactance, susceptance and admittance, current or voltage source in the network. A brief description of the theory is as follows: on a conventional network analyser the voltage E applied to a model resistance R will give a current flowing in accordance with $E=RI$. In a similar way, on the Blackburn analyser a voltage V_1 applied to the primary of an "ideal" transformer will result in a secondary output voltage of $V_2=V_1(T_2/T_1)$ where (T_2/T_1) is the turns ratio of the transformer. If the tappings on the secondary winding are adjusted so that the turns ratio is numerically equal to R, then the output voltage will be given by $V_2=RV_1$. If the secondary voltage V_2 is made proportional to E in the original equation, the primary voltage V_1 now becomes proportional to I. Thus, the transformer can be used to solve the equation $E=RI$ on the analogue principle.

A complex quantity such as impedance is simulated by a pair of "ideal" voltage transformers in the following manner: If a voltage $V+jV'$ is applied to an impedance $Z=R+jX$, then

$$V+jV'=(R+jX)\ (I+jI')$$

and $V=IR-I'X$

$V'=IX+I'R$

* Mr Parton is with the Engineering Group of the General Electric Co. Ltd., at Witton.

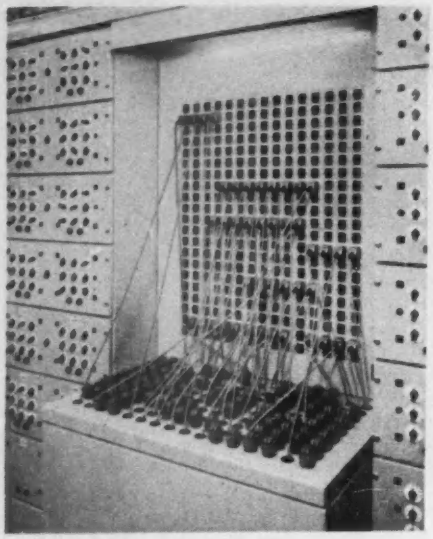


Fig. 3. One of the four plug boards provided on the analyser

If the transformers are interconnected as shown in Fig. 2 and the turns ratios A_2/A_1 and A_3/A_1 of the windings on the first unit are made equal to R and X, respectively, then a voltage equivalent to I applied to winding A_1 will result in voltages equivalent to IR across A_2 and IX across A_3.

Similarly, if the turns ratios B_2/B_1 and B_3/B_1 of the second transformer are made equal to X and R, respectively, then a voltage equivalent to I′ impressed across B_1 will result in voltages I′X across B_2 and I′R across B_3.

If windings A_3 and B_3 are connected in series, then the resultant voltage IX+I′R will be equal to V′ and similarly if windings A_2 and B_2 are connected in series subtractively, the resultant voltage IR−I′X will be equal to V. Thus, a unit consisting of two transformers with suitable cross connections can be made analogous to a complex impedance, and a number of units can be connected in series and parallel to represent a network. In practice, it is often convenient to represent loads by admittances rather than impedances and this is readily achieved by interchanging the input and output coils of the transformers. The normal tapping range of 0 to 1·999 in steps of 0·001 is by this means changed to a tapping range of 1/(0 to 1·999), so that by using either Z or Y as required, every unit has a range from zero to infinity. Current and voltage sources, mutual couplings, and transformer tap settings are also easy to simulate on the same principle, and all units have been designed to be identical and completely universal for any of these functions. It will be seen that apart from giving a very wide range of values and functions to every unit, it also gives the analyser an inherent accuracy of 0·1%.

This inherent accuracy of 0·1% is dependent upon the voltage transformers being ideal, as it will be appreciated that if a substantial amount of magnetising current should flow through the networks the 0·1% accuracy would be quickly lost. As the ultimate accuracy of the analyser depends upon the degree to which the apparent magnetising currents of the transformers can be reduced, a separate electronic circuit is incorporated on each transformer which continuously monitors the volts-per-turn and injects into a special compensating winding the required magnetising ampere turns. The overall result is that the currents flowing in the actual transformer analogue network are reduced to a very small value. The electronic equipment is built on a printed circuit.

Construction. It was considered essential on a full-size network analyser to design the layout and plugging arrangements so that the physical layout of the power system could be preserved, the main reason for this being the desirability of being able to plug up networks with the normal interconnection and busbar arrangements familiar to all power system engineers. The requirement was met by the use of special multi-core plugs and sockets and a corresponding specially interconnected plug board, an example of one of these is shown in Fig. 3, with 52 standard analyser units arranged in racks on either side. All 52 units in one section are connected to their plug-board by jumper leads, so that the units can be connected together in any way desired. Front sockets are also included in the individual units, so that interconnections can alternatively be made here, or a combination of plug-board plugging and front plugging can be used for special problems.

Metering. Two types of metering are employed, direct and a self-balancing bridge method.

Direct metering. The analogue voltages picked up from the analyser are fed to electronic summating networks which convert the quantities from cartesian co-ordinates into polar form, so that the normal power system quantities of volts, amperes, watts and vars can be displayed on conventional indicating instruments scaled in "per unit" quantities (foreground, Fig. 1). For ammeter and voltmeter, scales ranging from 0·1 to 31·6 per unit in multiples of $\sqrt{10}$ can be selected by means of switches. The range of the wattmeter and var-meter is the product of the ranges selected for the ammeter and voltmeter, and is automatically computed and displayed on an illuminated unit.

Self-balancing bridge metering. This equipment consists of four independent self-balancing bridge units metering the two cartesian co-ordinates of the voltage and current at the required point, and gives an illuminated in-line number display of the results. Each meter consists basically of a reference transformer, the output voltage of which is varied by automatic tapping switches which run until the output voltage exactly balances the input voltage being metered. An electronic error detector measures the unbalance voltage and sends the required signal to the three switches, which automatically tap the reference transformer. The average time for a balance is approximately two seconds, and the equipment gives an accuracy of 0·1%, or 0·001 per unit of base.

Special Techniques Using Blackburn Analyser

Because of the greater versatility of the Blackburn analyser it has been found possible to tackle many types of power system analysis programme in a more simple and elegant fashion than is possible on conventional analysers. Some of the more interesting examples of these can be briefly described as follows:

Load flow. When connecting together a large involved power system with many generators, it is often found difficult to obtain easy control of voltage and power flow by the commonly used method of adjusting the generator EMF phase positions and magnitudes. With the present analyser, this difficulty has been removed by employing negative admittance units as generator sources. In a large network, therefore, one or two key positions will have EMF generation and become floating busbars, and all other busbars, whether supplying net load or generation, will be connected to earth by admittance units set to $Y = \pm G \pm jB$.

When adjusting the load flow on the network, therefore, all that is necessary is quickly to scan the general voltage levels after the initial energising of the network and adjust

the megavar generation or absorption at any required busbar in order to correct the voltage. Similarly when trimming the network, variations of G can easily alter the load generation or absorption at that point without basically upsetting the voltage level. In actual practice, therefore, the control desk operator tells his assistant to alter either the MW or the voltage level at a certain busbar as required, the chief merit of this principle being that each control is basically independent of the other.

Calculation of fault levels. Fault levels and currents are generally obtained on the analyser since these are relatively easy and quick to record once a circuit has been plugged up for normal system analysis. The wide range of all the units and the use of digital bridge metering is most useful in speeding this work, particularly when dealing with unbalanced faults needing the introduction of sequence components.

Transfer admittance readings. When considering the steady state stability of the system or its behaviour under fault conditions, a very convenient method is to obtain the relevant transfer admittance constants and then run the problem on the digital computer (see Ref. 1). When a circuit is already on the network analyser for study these transfer admittances are easily metered, typed on to tape with a teleprinter and fed directly into the digital computer. For a 26×26 matrix thus metered, a check was made using a digital computer programme, and the maximum error between any corresponding figures was 0·2% with most in the order of 0·1%. This was a very interesting check showing that the Blackburn analyser, even on a large system, actually has an accuracy of approximately 0·1% when using bridge metering.

Circuit reduction. When studying a local network fed from a major grid system at two or three feeder points, it is necessary to know the effective driving point and transfer impedances at these feed points. These will very often turn out to have negative resistance values and the ability to set these up directly on the analyser and then carry on with accurate load flow, fault level or stability investigation has proved most valuable.

Phase-shifting transformers and other special functions. The basic analogue form of this type of analyser makes it very simple to interconnect the standard units together to simulate any special form of circuit coupling. Transformer tap changing, phase shifting transformers, special balanced or unbalanced mutual couplings, etc., have all been found useful on special occasions. A special connection switch is built between pairs of two standard units so that this interconnection can be done automatically without the need for any basic knowledge of the Blackburn principle. For many unbalanced fault problems and special circular analysis work these extra facilities have proved important.

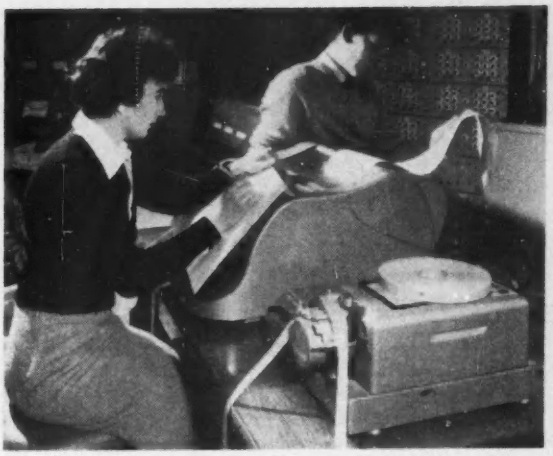


Fig. 5. Checking swing curve calculations coming back from computer

Digital Computer Facilities and Techniques

Most of the present computer programmes have been developed for the Mercury computer using either autocode or machine code instructions. This computer is a fast, medium size computer for scientific problems and prior to this, valuable load flow experience had also been obtained on a smaller Pegasus computer using prepared programmes that were already available. Future work will be centred upon the Orion computer which is several times larger and faster than the present Mercury computer.

The programmes written so far are listed below and have been written basically to save power system engineers time by taking over some of the data preparation and routine work for which the computer is the most efficient. Programmes in use at the present time are as follows:

Collection and arrangement of input information. Information often arrives in a complete muddle which has to be carefully sorted out before the problem can be placed on either the computer or the analyser. A major advantage of writing a programme to organise this work is that by the time the input form is filled in, it is possible to be sure that all the required data has been collected; in fact, these input forms can be sent to a customer to prevent him spending unnecessary time on detailed circuit diagrams, and to ensure that all the required data is collected with the initial correspondence. Many delays while letters are

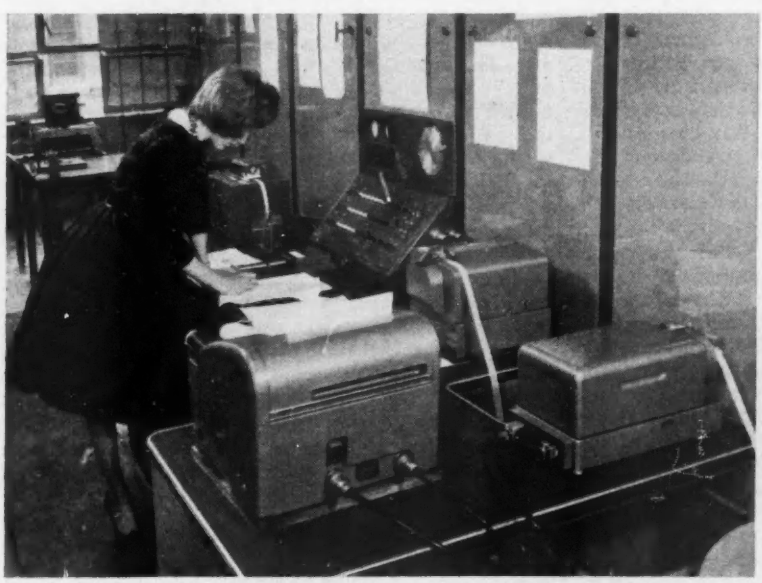


Fig. 4. The Ferranti Mercury Computer which is used at GEC, Witton, in conjunction with the Blackburn-type network analyser

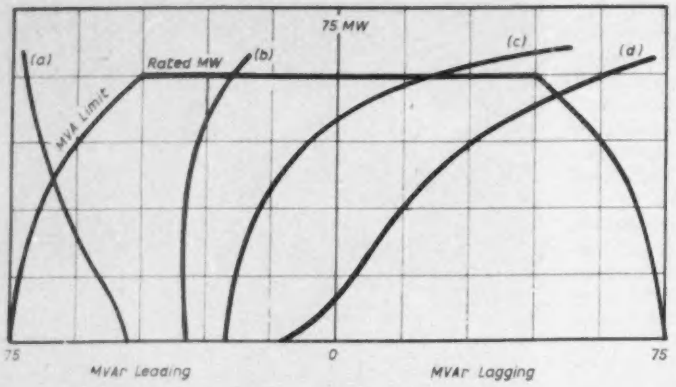


Fig. 6. Generator power chart with maximum transformer tapping. Dynamic stability limit curves are shown for machine controlled by a continuously acting regulator and feeding into an infinite system, via: (a) Short line (20% reactance); (b) Medium line (40% reactance); (c) Long line (100% reactance); (d) Very long line (200% reactance). In this last case the phase shift between terminal voltage has reached 90° so that the AVR can exercise no further control over stability

sent requesting missing information can thus be avoided. Also by allowing the computer to sort out its own per unit values from any given combination of input quantities, one common source of error is removed. Details of this are explained in the second article.

Another useful advantage is that when checking back on old jobs all the data will be found in the same standard arrangement making back-checking very much easier. One particular advantage of the programme for Blackburn analyser use is that should any impedance come out to be greater than 1·999 p.u. then the programme will automatically print out the equivalent admittance setting instead, together with a suitable indication. The final data output tape can, of course, be organised so as to be immediately acceptable by digital computer if required without further editing.

Digital calculation of transfer admittances. For some calculations stability checks are required on existing load flow balances. In some of these cases it is found more convenient due to pressure of work to calculate the matrix of transfer admittances on the computer instead of setting up these circuits and metering them on the analyser as explained in the previous section. A Mercury programme is available for up to 52 machines and 46 load busbars.

Swing curve calculations. As soon as digital computers became available the old practice of doing step-by-step swing curves by hand on the analyser was quickly dropped. Programmes have been written which will accept details of the initial conditions of the generator groups, together with the relevant transfer impedances between the groups and calculate the resulting swing curves for any set of fault conditions. The method used is that described in Ref. 1, and 52 machine groups can be included in the present programme. By feeding in the unfaulted system transfer admittance matrix a simple check can also be made on the steady state stability of any network.

Stability limits: alternators with voltage regulator control. A programme has been written for the specific case of one alternator feeding into an equivalent infinite busbar via a simple impedance or a long transmission line, and will calculate the leading angle stability limits for any setting of the voltage regulator circuits. The programme can check any general type of voltage regulator circuit, the individual loops of the regulator being detailed to the computer in a manner similar to that used for detailing circuit parameters and connections. Routh's criteria is used to determine the ultimate stability limits, and the programme automatically plots out a curve showing the megavar limit from zero to rated MW (Fig. 6).

System loss calculation. When accurate values are required for system losses it is not practical to evaluate these from a network analyser study. This is simply because in any individual lines these losses are inevitably a small fraction of 1% of the base and, therefore, it becomes unrealistic to assess losses from any summated figures for generation and loads spread over a large number of units. The present programme accepts line details and MW and MVAr loading, usually obtained from an analyser study, and proceeds to summate I^2R losses for the system.

Phase sequence conversions. When a set of unbalanced faults has been studied on the analyser, a short programme converts all the sequence quantities obtained from the analyser into a list of the relevant phase quantities.

Conclusions

The question is now often raised as to whether all power system analysis should not be carried out on the digital computer and network analysers rendered obsolete. In this author's opinion this is most unlikely for many years on practical and economic grounds. For example, studies on systems which are not well known, and where a number of variations are to be examined, will nearly always prove to be more economical on a network analyser, especially on major development studies of new systems. Also, the mere labour of balancing a difficult power system on a network analyser gives the engineers considerable insight into the possible dangers and limitations of the system, this type of information being easily lost in a computer programme that simply churns out a final load flow.

On the other hand, where the odd or a few specific questions have to be occasionally asked of a well established network, particularly where the data tape is already available, then the digital computer will most likely prove more economical. Only the largest digital computers, however, are really capable of doing large comprehensive studies similar to those described in these articles, and the real cost of doing this work on a digital computer should be carefuly considered. Also, unless one can ensure that the computer operators are intimately acquainted with the details of the computer programmes being used, a surprise failure of the programmes can prove difficult and expensive to sort out.

The methods described in this and the following article have been developed with the aim of taking the most practical advantage of both computers and analysers, and it is anticipated that these ideas will not only prove to be the most practical for several years, but may well always prove to be the most acceptable to outside customers requiring assistance in power system studies.

Acknowledgment. The author wishes to thank the Directors of the General Electric Co. Ltd. for permission to publish this article.

(To be concluded)

REFERENCE

1. *Power System Stability*, by S. B. Crary, Vol. 2, Chapter 5.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Contracting Wages

I HAVE read your report (page 1017, 22 June issue) of the criticism which Lord Merrivale levelled at the Electrical Contracting Industry in respect of its agreement which operated on 1 January last. Is Lord Merrivale aware of:

(1) The efforts made by the National Federated Electrical Association in the past to secure the consultation which he advocates.

(2) The serious complaints made by the National Federated Electrical Association to the British Employers' Confederation whilst it was a member of that body, that employers in other industries appeared to have a complete disregard for the agreements existing in respect of electrical contracting operatives.

(3) The very serious embarrassment caused to the National Federated Electrical Association and, for that matter, the Electrical Trades Union as well by the employment of electrical contracting operatives by members of the Federation of Civil Engineering Contractors and the Engineering Employers' Federation at rates very substantially in excess of those negotiated by the ETU and the NFEA and even without regard to the agreements which exist in their own industries.

(4) The award of substantial bonuses on the basis of payment by results to electrical contracting employees without any regard to output whatsoever, but simply on the basis of the payment by results schemes introduced on spectacular buildings in respect of building and civil engineering operatives.

Would it not be well for Lord Merrivale to seek information as to the facts underlying the agreement which he criticises before venturing to make such public statements?

L. C. Penwill, C.B.E., COMPANION I.E.E.,
DIRECTOR, ELECTRICAL CONTRACTORS' ASSOCIATION.

Off-peak Costs

AT long last some of the problems associated with undue emphasis on electric floor heating are being publicised, and your editorial under the above heading is timely.

Surely the time has arrived when the electrical supply industry should examine most thoroughly other methods of continuous electric space heating which have a high load factor and utilise large numbers of units per kW installed, the key to profitable load building.

For example, consider the continuous electric heating of a tall block of flats. Already some of the problems associated with floor heating in this type of building—copper, customer satisfaction, lack of flexibility, poor diversity, etc.—are becoming evident. This block of flats could be heated by the electrical equivalent of a hot water central heating system, namely, a tailored (I emphasise this) oil filled electrical radiator system under time switch and local room thermostat control—the whole heating system for the block being controlled by a load controller.

The load controller would automatically go around the system switching off for short periods up to, say, half-an-hour or even three-quarters of an hour, individual heating circuits so that nearly 100% load factor may be obtained. The thermal carry-over of the radiator (half-an-hour) together with the thermal carry-over of the room will ensure a continuously high standard of comfort.

The contribution to the maximum demand can be so controlled that it is never more than 25% of the total load installed and possibly less. Consider the savings in capital cost and especially the savings in copper. The flat dweller will be able to control the amount of heat required and thus everyone is happy. There will be no need to provide 2 kW electric fires for topping up with a possibility of all these fires coming on at roughly the same time in very cold weather. Surely there is now enough evidence to justify large scale field tests.

Finally, everyone appreciates the Supply Authorities need to develop some "off-peak" load but here again, should one not pay more attention to the main advantages of electricity—its ease of control—its flexibility. Experiments are being conducted with heat storage batteries designed in the form of heat exchangers so that they may be used as warm air whole house heating units—thus ensuring that the heat output can be correctly controlled. Has not this method enormous advantages over floor heating?

Obviously, floor heating has a place, but the danger is that the supply industry may spoil its own case by giving it undue preference or excessive publicity.

My plea is for a thorough examination of the whole field of continuous electric space heating—radiators, warm air, baseboard ceiling heating, etc. Let us try to get at the truth so that the advice given to the customers is the best possible.

A. C. Hazel,
MANAGING DIRECTOR, HURSEAL LTD.
CAMBERLEY, SURREY.

Representatives Complaint

AS a manufacturer's sales representative and also a technical expert on my firm's products, I had a shock recently when calling on a new wholesaler in Manchester.

I asked to see the manager, who also does the buying, and I was informed he was too busy to see travellers. A large sign in the corner of the showroom was pointed out, which said: "Sales representatives can only be seen by appointment." Now, this firm have a number of sales reps. from their branches and if they treat the manufacturers' reps. who call on them with this notice, I hope all their reps. in return get the same greeting from the firms on which they call.

Let the Electrical Trades' Commercial Travellers' Association take up this matter. We sales reps. have our living to make by seeing people.

Sales Representative,
MANCHESTER.

Superconducting Transformer. A transformer having conductors kept at a low enough temperature to be superconducting is claimed to have operated with 15 kW rating in the USA. Interleaving primary and secondary windings prevents the magnetic field becoming sufficiently strong to make superconductivity impossible, previously an obstacle to the possibility of such a transformer. A helium refrigerator is used to cool conductors. Dr R. McFee, of Syracuse University, is the inventor.

Plastics in the electrical industry

1961 INTERPLAS IMPRESSIONS — from a Contributor

ALTHOUGH the International Plastics Exhibition was designed to cover the whole field of plastics, it was not difficult to see the strong connection with the electrical industry. In all the halls of Olympia there were stands showing electrical mouldings, instrument housings, extrusions, laminates and many other products. Some of these were new, but others were just to remind us what the plastics industry can do.

However, to see the obvious was not the object of a visit. It was hoped that there would be new materials and processes and perhaps indications of trends which could be developed. The exhibition did not disappoint in this respect. There were a number of trends discernible of importance to the electrical industry. The rapid growth of glass fabric reinforced polyester resins was most obvious, and the use of vacuum forming for the cheap and quick manufacture of housings, even large ones, appears to have tremendous possibilities.

Apart from processes, there were a number of interesting materials. Comparatively new plastics included "Delrin" manufactured by Du Pont, Cycolac sold by the Anchor Chemical Company and Ralsin nylon by Whiffen and Sons Ltd. There were also many new applications for better-known materials, PTFE in particular being much to the fore. The epoxide resins, alkyd moulding powders, polythene, polystyrene, all, however, made significant contributions to the applications of plastics to the electrical industry.

New Materials

The newest material on show at the exhibition which appeared likely to have the greatest impact on the electrical industry was Delrin, sold in the UK by Du Pont Co. (United Kingdom) Ltd. The material is a tough, rigid thermoplastic, a polymer of formaldehyde, known chemically as a linear acetal resin, or polyoxmethylene. It is claimed to be the first plastics with strength properties approaching those of non-ferrous metals. Such claims have been made before, of course, but there is no doubt that this material is unusual. It was not introduced into the USA commercially until 1960, but already there are 500 known commercial applications. Moreover, to stress the metal strength theory, 82% of the materials replaced by Delrin were metals.

Delrin is not intended for use as electrical insulation, but for mechanical purposes. The material is extremely rigid without being brittle and in its toughness and resilience it much resembles spring steel. More important, however, it retains these properties to a high degree under adverse conditions of temperature and humidity, under prolonged stress and during exposure to most solvents. It is much lighter than metals, can be fastened with screws, rivets or by welding, snap and interference fits, and can be machined more easily than free-cutting brass.

A guide to the potentialities of Delrin is obtained by a study of the applications for which it is already used. These include fluorescent light switch springs, coil forms, terminal bushings, electrical bobbins, the ring nut on a push-button switch, electric control cams, thrust plate for watt-hour meter, relay seats, TV selector unit, channel-tuning nut, tuning gear, vacuum cleaner gears, tape recorder gears, handles for portable radios, telephone transformer cases, telephone terminal bushings and various housings. In this connection the material is safe for use under water and is used as such in pump housings.

Aclar Film. This material is a new fluorohalocarbon manufactured by Allied Chemical (USA) and sold by Kingsley and Keith (Chemicals) Ltd. in the UK. In many ways the material resembles PTFE, which indicates its possibilities. A big difference is, however, that it can be heat-sealed by heat or high frequency heaters, both processes being extremely difficult with PTFE. Thus, many more fields of application are open.

There are several grades of the material differing in chemical composition and physical structure, but none of them contains any plasticisers or other additives of any kind. Aclar 22, a typical grade, has a dielectric constant at 25°C of 2·8 at 100 c/s and 2·3 at 10^9 c/s. The power factor changes in a similar way being 0·019 at 100 c/s and 0·004 at 10^9 c/s. The surface resistivity is $>10^{16}$ ohm-cm at 25°C and the tracking resistance is quite good. These figures seem to indicate that the materials will be very useful to the electrical industry, particularly in view of the easier processing, so that some replacement of PTFE can be anticipated.

The other properties of Aclar are of great interest. Its solvent and chemical resistance, although not as good as PTFE, is better than most materials. It is virtually unaffected by the strongest acids and only attacked by the most powerful organic solvents such as ethylacetate, methylethylketone and trichloroethylene. The latter causes swelling to the extent of 10% in two weeks at room temperature, the others mentioned causing much less swelling. The material is tough, has low permeability to moisture vapour and other gases and resists extremes of temperature. It is still flexible at −150°C and retains some useful properties at +200°C.

Product for Styling

With electrical manufacturers taking far more notice of styling in their goods, particularly domestic appliances, Cycolac is a valuable new material. It appears to have been known fairly well before the exhibition, but its value has been emphasised over the past few months and now particularly on the stand of Anchor Chemical Co. Ltd.

Cycolac is one of the polymers of the interesting family of ABS (acrylonitrile-butadiene-styrene) thermoplastic resins produced by the Marbon Chemical Division of Borg-Warner. The materials (there are 11 major formulations) are tough and rigid with exceptional dimensional stability, high gloss finish, light weight (s.g. as low as 1·02), chemical resistance and a wide colour range. It is such

properties as these and the fact that the material can be processed so readily by most processes, including extrusion, which make it suitable for so many housing applications. However, the electrical properties are also quite good, as the following figures illustrate.

		Type of Cycolac		
		H	*L*	*LL*
Dielectric constant	60 c/s	2·87	2·86	3·20
	10^3 c/s	2·86	2·85	3·12
	10^6 c/s	2·76	2·77	2·90
Power factor ...	60 c/s	0·005	0·005	0·005
	10^3 c/s	0·006	0·006	0·007
	10^6 c/s	0·009	0·008	0·014
Volume resistivity	ohm-cm	$>3·8\times 10^{16}$	$>3·92\times 10^{16}$	$>3·54\times 10^{6}$

The Type H is for maximum toughness, Type L is for maximum toughness at low temperature, Type X7 is for high heat resistance and Type LL is for manufacture of extruded pipes. Some examples of the use of the materials indicate their possibilities. The moulding of telephone receivers speaks well of their toughness, and one of the finer "selling points" which catches the attention is that the material cannot be stained by lipstick, hand creams or tobacco smoke. This, it is claimed, requires less replacement of luxury coloured telephones. General Electric (USA) have used Cycolac for the housing of a portable food mixer, household knife sharpener and the electric can opener. Other appliances using Cycolac include cases of transistorised radios, vacuum cleaner housings and similar components for air-conditioners and dictating machines and also for electrical wiring harness connectors utilising heat resistance and uniform dielectric constant.

Water-resistant Nylon

None of the various nylons are seriously affected by water, but Ralsin, a new nylon on the stand of Whiffen and Sons Ltd., is claimed to have a lower water absorption than any other nylon. This advantage may be taken to all the well-known applications of this tough material, including gears, door-catches, casings and sealing rings. Apart from machined and moulded components, there are also strong, lightweight flexible tubes, extruded to very close tolerances, high pressure hose and a tough coating material for use as a protective lining for valves, etc. These coatings withstand temperatures from −40°C to +130°C.

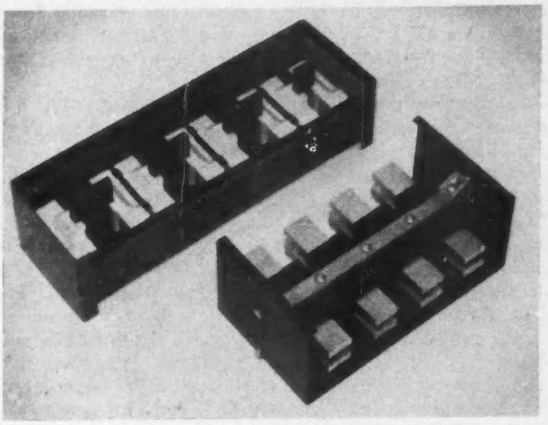
Another comparatively new material, featured by The North British Rubber Co. Ltd., was Royalite, the nitrile thermoplastic sheet, now made in this country. It appears to add confusion to the housing material situation, since, although quite different to the plastics already described, it has many similar applications. It has the elasticity of rubber with the rigidity of a plastics material with high impact strength and attractive appearance.

Some of the claims made for Royalite will interest the electrical engineer. It is non-magnetic, which will make it useful for meter cases; it does not develop a static charge and it is electrically non-conductive. For this reason it is successfully used in the manufacture of junction boxes, high line protectors and similar devices.

Mineral Fabric Reinforced Plastics

It was impossible to resist the attraction of the glass-reinforced plastics on show at the exhibition whether they had any connection with the electrical industry or not. In particular, the gleaming white boats and sports cars attracted very much interest. It was difficult to realise that these complex curves were moulded from plastics.

The basic principle behind all the products is the combination of polyester or other resins and glass fabrics. One layer of the latter is applied to the male half of the mould, liquid resin is brushed on, more fabric is applied, more resin and so on until the required thickness has been built up. This is then moulded at elevated temperatures and relatively low pressures.

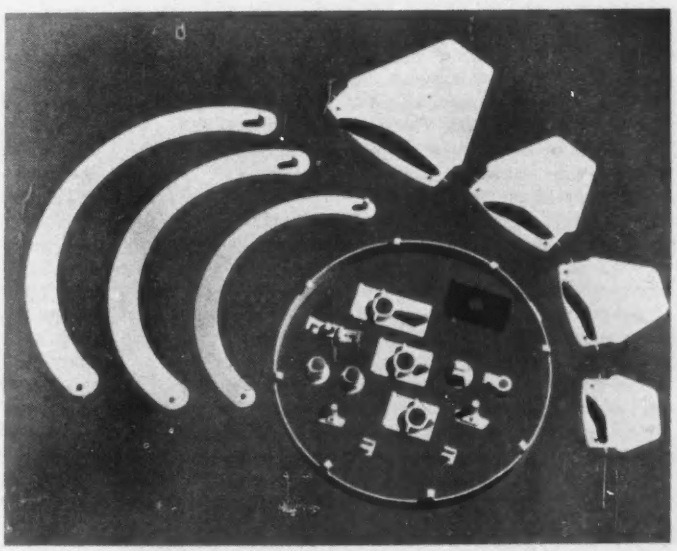


Economy through use of plastics is seen in the lower Marryat and Place busbar trunking unit, in which Rockite DMC mouldings replace the ceramic insulation of the top unit

Railway Signal Relay Station

Probably the most interesting exhibit at the exhibition was the futuristic, domed railway signal relay station made of glass-fibre reinforced polyester resins. It was a full-scale replica of the station first erected for British Railways Eastern Region electrification scheme at Stanford-le-Hope on the Tilbury-Southend line. The building is 19 ft long, 14 ft wide and 10 ft high and was built to house the electrical control switchgear, also installed at the exhibition.

The plastics was chosen for the building for two main reasons. It is expected that such buildings will be installed



The new Delrin acetal resin is used for all these parts of a Vent-Axia unit

in inaccessible positions, so the fact that this design took only a few hours to erect is important. Similarly, it is self-coloured, completely weatherproof and will, therefore, require next to no maintenance. The walls and roof, with a double curvature, were made of a sandwich construction consisting of an outer laminate of polyester reinforced glass-fibre about $\frac{1}{8}$ in. thick; a $\frac{1}{4}$ in. thick phenolic foam ensuring good thermal insulation and fire resistance and an inner laminate about $\frac{1}{8}$ in. thick formulated to give a low surface flame spread.

British Railways are rightly very pleased with this development, moulded by Mickleover Transport Ltd., and the station is to be the first of many.

Bristol Aeroplane Plastics Ltd. were exhibiting a high-speed radar scanner made from a laminated construction but using asbestos as the fabric and phenolic resin for binding. Since the scanner is required to function with maximum efficiency in all weathers, particularly in salt-laden atmospheres, the plastics scanner is ideal. The asbestos used was "Durestos."

The manufacture of articles such as those described now appears to be within the scope of most manufacturers. Fothergill and Harvey Ltd. are selling Pre-impregnated Tyglass with the resin included and ready for application to the former. Type 1 has a phenolic resin incorporated but other types are available. Another development of this company is glass-cloth woven in three dimensions. In making a radome, for example, the usual method of working is to apply a large number of small pieces of glass-cloth so that they can be readily trained round the contour concerned. When it is realised that up to 40 layers of fabric are necessary, then the difficulty of the task can be appreciated. Now Fothergill and Harvey weave a "sock" ready to apply over the male mould, which saves much time and ensures dimensional consistency.

Plastics Conduit

It would have been easy to slip into a prolonged argument on the respective merits and demerits of plastics and metal conduit. All the PVC pipe extruders are naturally biased, but it was difficult not to share some of their enthusiasm at the exhibition.

There is no doubt that the Continent, particularly Sweden, is adopting plastics conduit on a large scale and it will not be long before the British industry will have to find some convincing reasons for not following suit.

There are a number of firms who now supply extruded thermoplastic cables, some of the most prominent being Durapipe and Fittings Ltd., Yorkshire Imperial Metals Ltd. and Uni-Tubes Ltd. Conduit can be supplied in rigid PVC, high-density polythene and ABS, although other materials are available if necessary. Rigid PVC appears to be the most common and the range supplied by Durapipe and Fittings Ltd. is outstanding. Tubes are available from $\frac{1}{8}$ in. up to 6 in. diameter, which is likely to cover most cable requirements. In addition, over 450 moulded pipe fittings are in stock, which include tees, elbows, sockets, flanges and saddles, etc. The 6 in. moulded fittings are claimed to be the largest of their type available in Europe.

The PVC tube is non-inflammable, essential, of course, for conduit purposes. Threads can be formed by the usual methods, as can bends, except that the whole length of pipe must be warmed first. Rigid PVC pipes are extremely corrosion-resistant and this is where they are likely to find one of their biggest applications for the time being. One installation of this sort was under the British Railways bridge at Lodge Road, N.W.8. Corrosive, sulphurous fumes caused severe damage to the mild steel pipes encasing three 66 kV two-core oil-filled cables. To prevent further damage the steel pipes were replaced with rigid PVC conduit having an internal diameter of 6·06 in.

Flexible conduit, with or without PVC protection, is sold by Uni-Tubes Ltd. under the name Kopex. It is easily installed, but its properties are too well known to be considered further, except to observe that the corrosion-resistant properties of PVC can be utilised if required.

New Processes

It is advisable to think carefully about all existing processes, since one can never be certain when they will be useful in a totally unexpected quarter. In any case, walking round the exhibition, it was difficult not to stop and look at injection moulding machines and others at work. Two of the most interesting processes were blow moulding, where so many polythene "squeeze" bottles are made, and vacuum forming which can be used for making so many containers. It was this process which seemed to have possibilities for the electrical industry.

Refrigerator compartments (in Perspex) are normally made by the vacuum forming process, which illustrates its potentialities. The basic process consists in heating a sheet of plastics (Perspex, PVC, polythene, etc.), placing it over a female mould and applying a vacuum to the underside, thus drawing the softened plastics down onto the shape of the mould. At first, this process was slow and entirely manual, but completely automatic machines are now available. Various containers can be produced at speeds of, say, 1,200/hr. It seems as if the process might well lend itself to the production of meter cases, housings (even for television and radio), battery boxes and so on.

The other interesting process was a comparatively new method of dip coating. There are obvious difficulties in using solution methods such as the problem of dissolving some difficult materials, the fire hazard, solvent recovery and eventual removal of solvent from the film. In this new method, a powder (of, say, polythene) is introduced into a tank and "fluidised" by blowing air through it from below. The object to be coated is heated, dipped into what appears to be a liquid, removed with a layer of powder clinging to it and "cured" in an oven. Dohm Ltd. make a suitable tank and Telcon Plastics Ltd. sell suitable powders, including polythene, cellulose aceto-butyrate, PVC and epoxy resins.

Miscellaneous Products

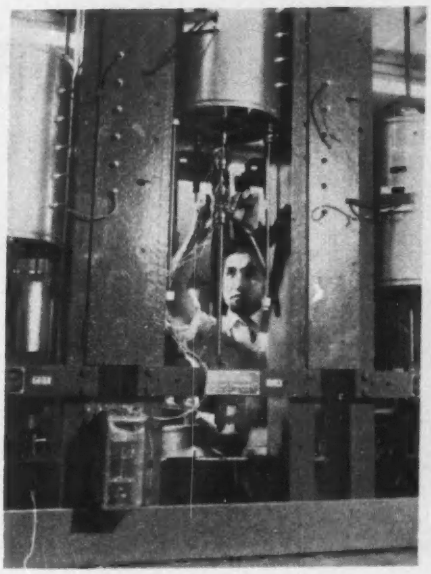
It would be easy to give a long list of other products of interest to the electrical industry, but this would only leave a confused impression of the show. Instead, it is more useful to indicate a few of the more interesting items which could be seen.

The various epoxide resins for encapsulating never fail to arouse interest. The "Epophen" range of Leicester, Lovell and Co. Ltd. is a particularly good one and the dry-impregnated cloth for laminates gives better electrical properties than the "wet" lay-up methods. A comparatively new material now gaining great favour is the polyester moulding powders known as alkyds. Resinous Chemicals Ltd. were exhibiting their well-known range of Plaskon products, many with first-class electrical properties.

A last impression of the exhibition, which the electrical engineering industry must view with increasing alarm, is the number of materials which can be used for the same job. An example is telephones. British Resin Products Ltd. were exhibiting particularly well-styled sets in Styron polystyrene. But these are also made in phenolics, amino plastics and polythene. What will we have next?

E.R.A. CREEP TESTING

New Laboratories Extend Facilities Essential to Power Station Development



One of the 25 three-specimen multi-rupture machines, showing thermocouples being attached to test specimens

BUILT during the past year on the ERA site at Leatherhead, a new Creep of Steel Laboratory is to be opened formally today by Dr C. Sykes, managing director of Thos. Firth and John Brown Ltd. Research on the high temperature properties of the steels used in generating plant has played a vital part in raising steam station efficiency. The ERA has been actively associated with that research since 1930, when it set up a committee, upon which steel makers and turbine makers and users were represented, which sponsored the accurate investigation at the National Physical Laboratory of the high temperature behaviour of certain typical steels. As a result, a creep-testing laboratory was built at the NPL and equipped with some 75 high accuracy creep-testing machines. A number of steels were examined here and, in addition, members of the committee submitted appropriate experimental results obtained in their own creep laboratories. It soon became evident that short-term testing was not sufficient, and periods of test had to be extended to times of the order of 20,000 hr or more.

ERA Equipment

As knowledge of the properties of steels increased and steam conditions became more onerous, the number of special creep-resisting alloys to be investigated also rose. The test programme was expanded to such an extent that the laboratory at the NPL could no longer cope with it, even though it had been reinforced by a further 50 machines installed in 1957 at the ERA Laboratories at Leatherhead.

The organisations represented on the committee therefore decided to provide for an extended programme by means of a new laboratory at Leatherhead, which would be devoted principally to long-time tests. This laboratory, completed at the end of 1960 with an area of 9,900 sq ft, is equipped with 50 high-sensitivity creep machines fitted with optical extensometers, 50 ten-specimen rupture machines and 50 dual-purpose machines for either dial gauge creep measurements or three-specimen multi-rupture. One 15-ton creep machine is included for testing specimens from the full wall thickness of steam pipes. In addition to the creep and rupture machines, 11 rigs have been installed, designed to test tubes stressed by internal steam pressure while at high temperature. Four such rigs have been in operation for several years at Leatherhead and are retained in the new laboratories as part of the experimental plant.

Some of the work on creep involves cutting specimens from full-size steam piping. The pipe seen here is 12 in. o.d., 3 in. thick

Testing Machines

In the multi-rupture testing machines either ten specimens or three specimens, depending upon the size of the furnace, are stressed in series at the same temperature and stress, and the time to fracture of each specimen is measured. Such testing machines are new to this country and make stringent demands upon the temperature control and other equipment.

Temperature control of the specimens for creep and rupture testing is achieved by electronic temperature controllers actuated by platinum resistance thermometers inserted in the furnaces. The temperature of each furnace is measured by either three thermocouples or five thermocouples, tied to the specimens and monitored at a central control desk.

From the measurements of time to reach a specific amount of creep or to rupture with variable stress or temperature, graphs are plotted which can be extrapolated to give the expected life of components used in the power station.

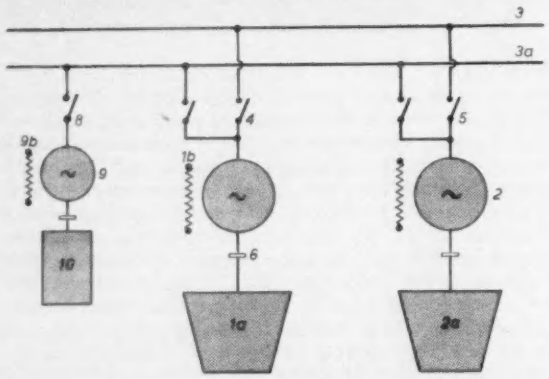
Another major item of research in this laboratory is the correlation of the high temperature stress rupture properties, obtained by uniaxial tensile tests, with those obtained by subjecting thick-walled tubes to internal steam pressure. The results are then compared with predicted values obtained from three simple design formulae.

PROGRESS IN PATENTS

SELECTED SPECIFICATIONS

Alternators as Synchronous Condensers

Techniques for facilitating the use of alternators in a power station as synchronous condensers, with minimum ancillary equipment but maximum efficiency, are described in Specification 871,188, granted to C. A. Parsons. The method suggested is to provide one low-rated auxiliary alternator with a driving motor and to install, also, auxiliary busbars to which the auxiliary alternator and any one main alternator can be connected. The main alternator is disconnected mechanically from its turbine and connected to the auxiliary through the busbars. It is then turned at low speed by the barring gear. Excitation current is



Main alternator 1 can be disconnected from turbine 1a, then run on barring gear after connection to auxiliary alternator 9. 1b and 9b are respective field windings, 10 the induction motor drive for alternator 9 to bring 1 up to speed. 2 is started similarly

supplied to the field of the main alternator, which generates sufficient voltage to supply magnetising current to the auxiliary alternator, which experiences an asynchronous torque sufficient to rotate it at a speed near to that of the main alternator. When excitation current is applied to the auxiliary alternator, it pulls into step. With the auxiliary and main machines synchronised together, the induction motor coupled to the auxiliary alternator can be run up, and the result will be to accelerate the main alternator to system frequency speed, when it can be synchronised and operated as a synchronous condenser, after disconnecting the auxiliary.

Among the advantages claimed for this scheme are the need for only one auxiliary alternator however many main alternators there are in the station; and the small size possible for the auxiliary alternator. If the more direct approach were adopted of running up the uncoupled main alternator from standstill with a supply from the auxiliary alternator, then the latter would have to supply the full magnetising current of the main alternator.

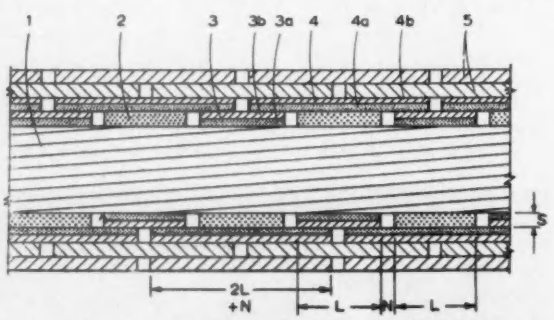
Liquid-cooled Rotors

The construction of liquid-cooled rotors for large alternators is described in Specification 870,721, which is attributed to a Hungarian inventor, Mr M. Seidner, of Budapest. His particular object is to give ready access to the pipe joints between the hollow rotor conductors and the water infeed. In one of the more obvious approaches to design of a liquid-cooled rotor, the water is led into the hollow conductors at the coil overhang. However, the heavy retaining rings around the coil overhang make any access to the pipe joints for inspection or repair difficult. The essence of the design proposed in this specification is that some coil connections shall be extended beyond the retaining rings, so that connections to the water system may be made outboard of the coil-end chamber, as the specification calls it. Water is assumed to be led into the rotor through an axial bore, returning along a co-axial space.

To facilitate the extension of the coil ends, a detailed winding arrangement is sketched in the specification, in which the hollow conductors are wound concentrically with end turns of each coil stack brought out to accept the incoming three-way water inlet joint, and also the half-depth coil brought out at the other end of the rotor to provide a return to the main water system.

Cable Screening

More effective screening between cable conductors and dielectric is the aim of an invention described by Pirelli s.p.a. of Milan in Specification 870,953. The arrangement shown in the diagram uses two types of tape. One consists completely of conductive material such as aluminium or carbon-black loaded paper; the other is a two-layer tape,



Conductor 1 is screened by fully conductive tape 2 and half conductive tape 3, applied with gap K between turns. The next layer consists of wider half conductive tape, 4. 5 is a normal cable paper

half conductive, half insulating. Immediately next to the conductor tapes of the two types, of equal thickness, are placed alternately, with a small gap between them to avoid one tape riding over the other while they are being applied during manufacture of the cable. Over the two tapes is wound a wider tape, of the two-layer type. The effect of this construction is that any bubbles or globules within a gap between the two layers of tape are confronted with conducting surfaces at the same potential on each side of the gap. The claim is made that this end is sometimes attained by winding the screening tapes with an overlap, which clearly distorts the surface of the screening layer and brings about concentration of the electric field.

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Expanding Semiconductor Production

THE human touch, still vital to the manufacture of semiconductor devices despite the increasing use of automatic techniques, receives full recognition in the organisation and layout of the new 132,000 sq ft Texas Instruments factory at Bedford. It also played an unintended part in the inaugural tape-cutting ceremony. Equipment using semiconductor components, triggered by uncovering a solar cell and culminating in a 15 kV arc discharge, was to sever the tape, but a stiff breeze temporarily saved the last few threads from the arc. These were, however, promptly parted by hand.

The opening ceremony was performed by Sir John Cockcroft, F.R.S., Master of Churchill College, Cambridge, who referred briefly to the history of semiconductor development. Of particular interest to the universities, he said, was increasing production of semiconductor devices. This, it was hoped, would lead to lower costs, so enabling many universities to build, in a few years' time, computers which now cost several million pounds. Recent developments indicated a promising future for the tunnel diode, and work was to proceed at the new factory on the possibility of using gallium arsenide and organic materials for devices. Of particular importance to high-speed computer technology was the progress made in microminiaturisation. A good example was a solid state multi-vibrator which was 100 times smaller than its printed circuit equivalent.

Introducing Sir John was Mr P. E. Haggerty, president of Texas Instruments Inc., the American parent company.

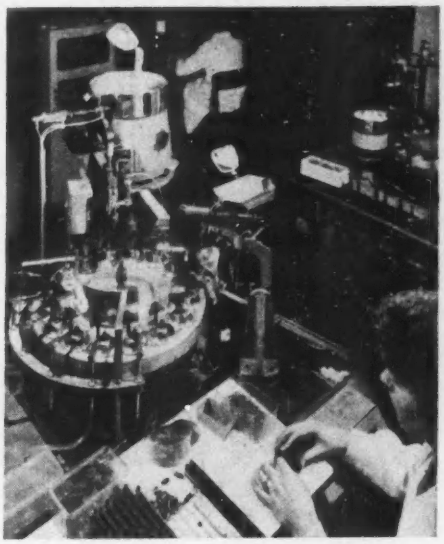


Fig. 1. This machine automatically assembles the parts for glass diodes

At the conclusion of the opening ceremony he announced that, under a seven-year covenant, Texas Instruments would pay £750 annually to Churchill College.

The new factory has been designed on the lines of one of the company's American plants. An unusual feature is the roof structure, which consists of 25 inverted-pyramid shaped reinforced concrete sections, each 50 ft square and supported on single pillars. For the many services required, a 10 ft space is provided beneath the working floor and piping is brought through the floor at 10 ft intervals.

Full air-conditioning is installed with refrigeration plant to maintain a temperature of 70°F. Throughout the manufacturing area, colour-corrected fluorescent lighting is installed, giving both direct illumination and light reflected from the roof shells.

Fig. 2. Semiconductor devices are manufactured and assembled in this air-conditioned area at the new components factory of Texas Instruments. The inverted pyramid roof construction used for the main factory can be seen

Semiconductor Symposium

As part of the opening day activities, a symposium was held to briefly review developments. It was pointed out that in the USA device production was likely this year to exceed 200 million, and that it was now a matter of routine to grow silicon and germanium crystals with an impurity content of one part in 10^7 or 10^8.

Encapsulation remained a problem, and in the next few years it was likely that some form of glass protection would replace metal canning. Transistors with switching times far less than anything yet available commercially had been achieved in the laboratory using gallium arsenide; but these were a long way from quantity production.

In a review of applications, reference was made to a motor controller using silicon-controlled rectifiers and suitable for outputs of 5 h.p. The controller had been developed for fork-lift trucks. High efficiency was claimed over the speed range, which was variable between 10% and 100%. Also under development was a 25 A silicon controlled rectifier.

Personalities *in the industry*

Mr G. H. Foot

Mr S. J. Wilson

Mr J. H. Scott

Mr J. F. Prince

Mr K. D. Starr

Sir Mark Turner has accepted an invitation to join the board of Pyrotenax Ltd.

Mr H. G. Nelson, managing director of the English Electric Co., has now also been elected president of the Society of British Aircraft Constructors for 1961-62.

Mr G. H. Foot, B.SC.(ENG.), A.C.G.I., A.M.I.E.E., A.M.AM.I.E.E., has been appointed director and chief engineer of Submarine Cables Ltd. (owned jointly by AEI and BICC). And, as from 1 Aug., **Mr S. J. Wilson,** previously joint manufacturing manager of the AEI Cable Division since January, 1960, becomes works director of Submarine Cables. Mr Foot joined the latter concern in 1958 and, in 1959, became manager of the Repeater Division. From 1936 to 1946 he was engaged in the development of carrier transmission systems in the Telecommunications Laboratories of Siemens Brothers and, for the next five years, was with the Companhia Telephonica Brasileira, Rio de Janeiro, first as a transmission engineer then as assistant plant extension engineer. Mr Foot returned to England and, in 1952, joined the Philips group of companies, first with the telephone group of Mullard Ltd. in London and later with the Philips Telecommunications Division, Hilversum, Holland, on liaison duties with the Philips companies overseas. From 1957 until he joined Submarine Cables Ltd. he was engaged in the study of future telecommunication systems with AEI Woolwich. Mr Wilson started his career as a junior at W. T. Henley's Telegraph Wks, Gravesend, in 1922, becoming superintending assistant in the Engineering Department in 1928 and, in 1935, transferring to Henley's Tyre Co. as works superintendent. In 1936 he joined the Cable works and was appointed assistant works manager in 1942. He became deputy works manager in 1951 and general works manager in 1952. Mr Wilson was associated with the development of the overseas cable factories of Fairfield Cables in Australia and of African Cables Ltd. in South Africa and also took part in the planning of the new factory for Henley Cables India Ltd.

Mr Justin H. Scott, B.A., has been appointed to the board of Laurence, Scott and Electromotors Ltd., thus renewing the active participation of the Scott family in the management of the firm founded by his grandfather in 1883. His father, whose untimely death occurred in 1942, was then managing director. After gaining his degree at Cambridge, Mr Scott joined the company about ten years ago at the Norwich works, where he has already held executive positions.

Mr D. W. Cowe has been appointed district commercial engineer at Stockton-on-Tees to the North Eastern Electricity Board (*ESH, page 152). He succeeds **Mr A. Plumpton** who has joined the South Wales Electricity Board, as we earlier reported. Mr Cowe joined the South East Scotland Electricity Board as a graduate trainee. He subsequently became assistant district engineer at Stirling, and later moved to Glasgow.

Manager of the Export Sales Department of the General Electric Co. Ltd. at Witton since 1930, **Mr J. F. Prince,** M.I.EX., retired at the end of June after over 42 years' service with the company. His successor is **Mr K. D. Starr,** B.SC., A.M.I.E.E., A.M.I.MECH.E., who has been chief engineer and director of the British General Electric Co. of Central Africa (Pvt.) Ltd. When he joined GEC in 1919, Mr Prince specialised in the electrification of textile mills. He became manager of the company's Engineering Dept. at Liverpool in 1924 and manager, Export Sales Dept. at Witton in 1930. Mr Starr obtained a first-class honours degree at Birmingham University. From 1943 to 1947 he served with the REME in India and the Far East, rising to the rank of Captain. He joined GEC in 1947 and, on completing his graduate apprenticeship course, was appointed liaison engineer in the company's Export Department in London. In 1950 he was transferred to the British General Electric Co. (Pty.) Ltd. at Johannesburg as a branch engineer and, three years later, was appointed chief engineer and, subsequently, director of the British General Electric Co. of Central Africa (Pvt.) Ltd. at Salisbury, S. Rhodesia.

Previously commercial engineer with Atlas Lighting Ltd., **Mr E. Moran** has joined the Installation Equipment Group of the General Electric Co. Ltd. as the group's senior representative based in Leeds. He is well known in Yorkshire as a lecturer on installation technology at Leeds College of Technology, where he has taught for the past seven years.

The directors of Marco Refrigerators Ltd. announce that **Mr A. B. M. Simpson** and **Mr N. H. Leach** have been appointed directors of the company.

Deputy general manager of the Renfrew, Dalmuir and Dumbarton works of Babcock and Wilcox Ltd. for the past two years, **Mr T. Carlisle,** B.SC.(ENG.), A.C.G.I., has been promoted to general manager of those works. Educated at Minchenden County School, London, and at the City and Guilds (Engineering) College, Imperial College of Science and Technology, London University, where he graduated in chemical engineering, Mr Carlisle joined Babcock and Wilcox Ltd. in 1944 and was appointed to the Project Department. In 1948 he was transferred to the New York office and, two years later, became the company's

**Denotes revision to the "Electricity Supply Handbook, 1961."*

New York representative in the United States. He returned to Gt Britain in January, 1954, to take up the appointment of assistant general manager of Renfrew and Dumbarton works.

Commercial executive of the Electronic and Equipment Group of the Plessey Co. Ltd. since 1960, **Mr G. A. Smith** has been appointed general manager of that group. Mr Smith has been with the company since 1957, initially responsible for the overseas selling of electronic equipment with Plessey International Ltd. and then as general manager of the Plessey Telecommunications Division. He became commercial executive of the Electronic and Equipment Group last year. During the war he was a radar officer in 60 Group, serving with the RAFVR. For ten years after leaving the service, Mr Smith worked with Pye Ltd., initially as a development engineer and later as the export manager of the Pye Telecommunications Division.

After 12 years as general manager for Johnson and Phillips Ltd. in India, **Mr C. Eric Stewart,** M.I.E.E., M.A.I.E.E., has returned to this country. He has joined the J and P head office at Charlton where he will be engaged on duties related to overseas business generally. Mr Stewart commenced his service with J and P in 1926 and was appointed to their Indian organisation in 1945. His successor as general manager in India is **Mr R. E. Negus,** A.M.I.E.E., who joined the company in 1950 and, from 1951 to the end of 1955, served in Hong Kong and Malaya with China Engineers Ltd., J and P's agents in those territories. Since that time he has been attached to the J and P London branch.

Director and general manager of W. T. Glover and Co. Ltd., **Mr J. H. Maxwell** retired from executive duties on 30 June after 51 years' service with the company. His successor as general manager is **Mr E. P. G. Thornton,** A.M.I.E.E., who has been a director and deputy general manager. Mr Maxwell, who has been closely associated with the work of the Cable Makers' Association, became manager of Glover's Estimating and Order Department in 1928, sales manager in 1952 and general sales manager two years later. In 1955 he was appointed to the board in the capacity of deputy general manager, and in 1959 was promoted to general manager. Mr Thornton joined the outside contracting organisation of the company in 1939, was appointed a contract engineer two years later and was subsequently seconded to the works technical staff, becoming assistant chief engineer, Paper Cables Division, in January, 1943. He was appointed technical manager (mains cables) later in that year, and in June, 1960, was made a director of the company with the executive responsibilities of joint assistant general manager. **Mr W. R. Gibb,** director and joint assistant general manager of the company, has been appointed assistant general manager, in which capacity he will deputise for Mr Thornton in his absence. Mr Gibb joined the company as secretary in 1944, was made a director and financial manager the following year, and appointed joint assistant general manager in June, 1960.

Marking the retirement of Mr J. H. Maxwell, director and general manager of W. T. Glover and Co., from executive duties a presentation of a "Rolleimagic" reflex camera and a pair of binoculars was made to him by Mr. R. M. Fairfield, (right) assistant managing director, BICC, on behalf of his co-directors, present and past. On behalf of the staff, Mr H. Henman, manager, London office, presented him with a cocktail cabinet complete with crystal glasses.

Lt-Gen Sir William Stratton, K.C.B., C.V.O., C.B.E., D.S.O., has been appointed chairman of Edwin Danks and Co. (Oldbury) Ltd., and of Penman and Co. Ltd., in succession to the late Gen Sir Kenneth Crawford. Both these companies are members of the Babcock and Wilcox group. Appointed deputy managing director of Edwin Danks and Co. (Oldbury) from 1 July is **Mr A. D. Thompson,** B.SC., who has been with the Babcock and Wilcox group since 1946, and for the past three years has been head of the Atomic Energy Commercial Section of B and W, being responsible for tendering on nuclear work and for the financial control of nuclear contracts. In addition, **Mr C. H. G. Haywood,** A.M.I.MECH.E., M.I.MAR.E., F.INST.F., general manager of the Combustion Division, and **Mr H. Harding Smith,** general sales manager, have been appointed directors on the board of Edwin Danks and Co. (Oldbury).

Three appointments to the board of directors of Midland Silicones Ltd. are announced. **Mr A. K. Simcox,** formerly general sales manager, now becomes sales director; **Mr J. S. Hughes,** who was manager of the Process and Product Development Department now becomes development director; and **Mr H. N. Fenn,** a director of Dow Corning Silicones Ltd., USA (with whom Midland Silicones are closely associated), also becomes a director.

Previously with Burco Ltd., initially as representative and then as area manager, **Mr E. H. Hemmings** has joined Berry's Electric Ltd., as representative in the MANWEB area.

Mr M. T. Marwood, D.S.C., has been appointed sales manager, Marine Department of Associated Electrical Industries Telecommunications Division. He succeeds **Mr W. E. Warren,** who is remaining with the Department in a consultative

Mr G. A. Smith

Mr C. E. Stewart

Mr R. E. Negus

Mr E. P. G. Thornton

Mr E. H. Hemmings

Mr J. Clement

Mr J. L. Thompson

Mr D. Gemmell

Mr R. G. Camp

capacity until the end of November. Mr Marwood joined AEI Telecommunications Division in 1958 as a member of the Public Telephone Exchange Systems Department and, in 1960, transferred to the Marine Department as assistant to the sales manager. Earlier he had served for 22 years in the Royal Navy, latterly specialising in telecommunications. He was promoted a lieutenant-commander in 1948 and retired voluntarily from the service in 1958.

Elected chairman of the Electric Lamp Industry Council for the ensuing year is **Mr J. Clement,** B.SC.(ENG.), M.I.E.E., sales director of AEI Lamp and Lighting Co. Ltd. Mr Clement is also a vice-chairman of the British Lighting Council and has been intimately connected with the lamp and lighting industry since 1956, but previously he was assistant manager, home sales, to the BTH Co. for a short period, after nine years as manager of their Birmingham office.

Formerly with AEI Ltd., **Mr R. A. V. Nonkes** is joining Walmore Electronics Ltd. as area representative for London E., E.C., and S.E. districts, Kent and Sussex.

Managing director of Reesoils Ltd., **Mr B. S. Taylor** has retired after 40 years' service with the company, but he remains on the board of directors. **Mr S. R. Jarvie** has been appointed a director of Reesoils Ltd. and **Mr C. M. Lloyd,** F.C.I.S., has been appointed secretary. **Mr F. J. Larard,** M.I.E.E., M.I.E.(AUST.), M.AMER.I.E.E., formerly of the Crown Agents for Overseas Territories and HM Colonial Service, has been appointed general manager.

We are now able to reproduce, above, the portraits of **Mr J. L. Thompson,** new managing director of Square D Ltd.; **Mr D. Gemmell,** A.M.I.E.E., who has become general manager of the Swindon establishment; and **Mr R. G. Camp,** A.S.M.A., executive director, whose appointments we noted last week.

Sir Hamish Maclaren, former director of Electrical Engineering at the Admiralty, has been appointed a consultant to Associated Electrical Industries. He will advise on all matters concerning electrical equipment for ships.

Mr P. Allaway has this month succeeded Mr C. Metcalfe, C.B.E., as managing director of EMI Electronics Ltd.

Sales manager of the Erith Engineering Works of the General Electric Co. Ltd., **Mr A. B. Price,** B.SC., A.M.I.MECH.E., retired at the end of June after 48 years' service with the Company. To mark the occasion he was presented with a cheque—on behalf of GEC by Dr K. J. Wootton, general manager of the Works. The many friends and colleagues of Mr Price also subscribed to a walnut cocktail cabinet.

Personnel officer to the South Wales Electricity Board since 1948, **Mr W. Crichton Vile,** A.A.C.C.A., A.C.I.I., A.M.B.I.M., has been chosen to be the Board's new district manager at Barry, in succession to **Mr Ben Jones,** ASSOCIATE I.E.E. (*ESH, pages 129-132). Prior to 1948, Mr Vile was accountancy assistant with Cardiff Corporation for five years, following seven years in private practice. Mr Jones, who has been manager of the Barry district since October, 1958, will be retiring in September after over 35 years' service in the industry. Immediately prior to nationalisation he was manager of the electricity and gas undertakings of the Bedwellty UDC. From 1948 to 1958 he was commercial manager of the Barry district.

A Welding Equipment Division of the English Electric Co. is being set up at the Accrington works to operate the

C.E.G.B. Regional Appointments

As part of the Regional reorganisation of the Central Electricity Generating Board, the following appointments of Deputy and Assistant Regional Directors, with effect from 1 July, 1961, have been made (*ESH pages 54 to 73):—

South Eastern Region: **Mr L. W. Stretton,** M.I.E.E., formerly acting assistant Regional director, North Thames Division, becomes deputy Regional director. **Mr F. W. Skelcher,** M.I.E.E., M.I.MECH.E., formerly Divisional Controller, Midlands Division, becomes assistant Regional director (North Thames Division). **Mr W. H. Dunkley,** B.SC., M.I.E.E., M.I.MECH.E., formerly acting assistant Regional director, South Thames Division, becomes assistant Regional director (South Thames Division).

South Western Region: **Mr R. H. Coates,** B.SC.(ENG.), M.INST.C.E., M.I.E.E., M.I.MECH.E., F.B.I.M., formerly divisional controller, Southern Division, becomes deputy Regional director. **Mr E. McCabe,** M.I.E.E., M.I.MECH.E., M.INST.F., formerly chief generation engineer, Southern Division, becomes assistant Regional director (Southern Division). **Mr H. S. Davidson,** T.D., M.I.E.E., formerly divisional controller, South Western Division, becomes assistant Regional director (Western Division). **Mr W. Wilde,** B.SC.(ENG.), M.I.E.E., M.I.MECH.E., M.INST.F., formerly divisional controller, South Wales Division, becomes assistant Regional director (South Wales Division).

Midlands Region: **Mr J. B. Jackson,** M.I.E.E., M.I.MECH.E., formerly divisional controller, North Eastern Division, becomes deputy Regional director. **Mr W. F. Cusworth,** B.SC.(ENG.), A.M.I.E.E., formerly generation engineer, Eastern Division, becomes assistant Regional director (West Midlands Division). **Mr O. S. Woods,** M.I.E.E., M.I.MECH.E., M.INST.F., formerly divisional controller, East Midlands Division, becomes assistant Regional director (East Midlands Division).

North Eastern Region: **Mr C. G. Richards,** M.SC.(TECH.), A.M.I.MECH.E., A.M.I.E.E., formerly divisional controller, Yorkshire Division, becomes deputy Regional director. **Mr E. Forth,** B.SC., M.I.MECH.E., formerly chief generation engineer, North Eastern Division, becomes assistant Regional director (Northern Division). **Mr G. B. Jackson,** D.F.H., M.I.E.E., overhead line engineer, Transmission Department, Headquarters, becomes assistant Regional director (Yorkshire Division).

North Western Region: **Mr J. L. Ashworth,** A.M.I.E.E., A.M.I.MECH.E., A.R.T.C.(S), formerly deputy Regional director, North West, Merseyside and North Wales Region, becomes deputy Regional director. **Mr D. F. Grant,** A.M.I.E.E., formerly chief generation engineer, North West, Merseyside and North Wales Region, becomes assistant Regional director.

company's welding business from this month. Manager of the Division is **Mr R. H. Boughton,** M.INST.W., chief engineer is **Mr F. Mullery,** M.INST.W., and sales manager is **Mr E. H. Ayres.**

Mr K. C. Davidson has been promoted to power engineer in charge of the Power Branch of the Hydro-Electric Commission, of Tasmania, following the retirement of **Mr C. V. Batchelor.** Mr Davidson's former position of deputy power engineer has been taken over by **Mr O. W. Koerbin,** latterly power station superintendent at Trevallyn.

Manager of the Kitts Green, Birmingham, engineering works of Remploy Ltd. for the past ten years, **Mr N. F. Nutt,** has been appointed production controller of the company's engineering group.

Mr Herbert W. Bennett has retired as sales director of the Birmingham Battery and Metal Co. after 51 years' service. In future **Mr A. W. Gibbins,** deputy managing director, will be responsible for sales.

Mr G. Davies and **Mr N. W. Jones** have been appointed to the board of Mawdsleys Ltd. as sales director and technical director, respectively. **Mr J. Softley** has joined the board of Designs and Installations Ltd., another subsidiary of Southern Areas Electric Corporation Ltd., as director and general manager.

Mr W. A. Frater, chairman and managing director of Otis Elevator Co. Ltd., has relinquished the position of managing director and becomes chairman and chief executive officer. **Mr Charles F. Day,** who has been associated with the company for over 30 years and a director since 1955, succeeds him as managing director.

Mr J. B. Upton, M.B.E., T.D., D.L., J.P., has been appointed a part-time member of the Yorkshire Electricity Board (*ESH, page 141). Mr Upton is chairman of Reckitt and Colman Holdings Ltd. and a director of other companies.

OBITUARY

Dr Lee de Forest, a pioneer in radio communications, died in the US on 30 June, aged 87. He was prominently known for his invention of the audion valve in 1907, a modification of Sir Ambrose Fleming's patent. But under a ruling of the American courts he received little financial benefit.

Mr B. Welbourn, M.ENG., A.K.C., M.I.E.E., a former chief engineer of British Insulated Cables Ltd., died on 1 July, aged 85. He retired as chief engineer in 1942, but remained a director of the company for several years. He started with BI in 1900 as contract manager and became chief engineer in 1927. He was vice-president of the IEE in 1929-32.

Cable terminations for impulse tests

PREPARING cables for impulse testing in a high-voltage laboratory may well be a time-consuming operation requiring skilled labour. This applies in general to the commonly used terminations such as oil-immersed ends, with or without stress cones, which are not only fairly complex but are often messy, particularly if leaks or a fire occurs on breakdown. A variety of testing techniques have been tried in the Electrical Engineering Department's laboratory of the University of Queensland to overcome these difficulties,

The simplest termination is an air termination of the shortest possible length. However, because of high stress concentration near the edge of the earthed metallised screen, this type of termination either has a low flashover voltage or causes puncture of the solid insulation at the termination. The disadvantages of the non-uniform field can be completely overcome by defining a uniform voltage gradient, between the earthed screen and the conductor, with a sheath of Silko non-inductive resistance ribbon as shown in Fig. 1.

This termination has been used for impulse testing several sizes of three-core screened 11 kV cable between 0·0225 sq in. and 0·25 sq in. conductor sizes; however, further tests on the termination described below showed that it was possible to reduce considerably the length of the termination. The cable preparation was simple—the lead sheath was removed for a distance of 4 ft and, after binding, the screen was bared for 3 ft. Silko ribbon was then placed on the insulation and bound to form a sheath with thread or cotton tape. An electrical connection was made by binding a few turns of copper wire over the tape.

The following describes in detail, tests carried out on two cables, conductor sizes 0·0225 sq in. and 0·2 sq in. A simple air termination 3 ft in length with no Silko grading resistance caused flashover at 160 kV peak. Applying a 3 cm wide Silko ribbon, resistance 50,000 ohms/metre, to the 0·0225 sq in. cable enabled the termination to withstand positive and negative impulses of 180 kV peak and also gave puncture of each core within the cable proper. For the 0·2 sq in. cable, 8 cm wide Silko ribbon having a resistance of 2,600 ohms/metre was used. In this case the termination formed the tail resistance of the impulse generator. This termination withstood impulses of both polarities at 270 kV peak and gave puncture within the cable sheath. The atmospheric conditions during these tests varied between:

Temperature	..	70 —72°F
Pressure	.. ..	760—766 mm of mercury
Humidity	.. ..	43 —81%

Tests were made to determine the maximum working gradient for this type of termination. With the 0·2 sq in. cable the resistance ribbon was reduced in steps to 21 in. and withstood repeated impulses at 250 kV peak. This is

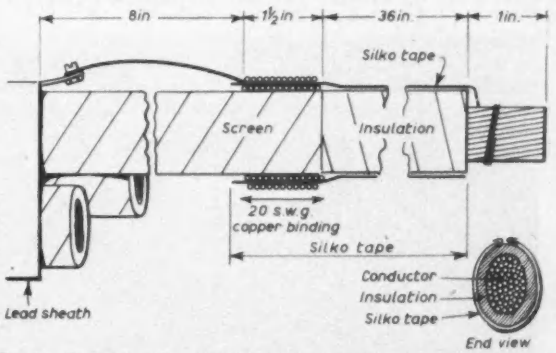


Fig. 1. One phase of an 11 kV cable prepared for impulse testing. A suitable test voltage gradient is ensured by using Silko high resistance tape as the outer test electrode

a gradient of 12 kV peak/in. Other terminations, with Silko ribbon of width insufficient to entirely cover the periphery of the paper insulation, showed that sparking occurred on the bare insulation and that the flashover voltage was reduced.

The tests described above indicate that a simple air termination of this type may be successfully used for impulse testing cables. Since a gradient of 12 kV peak/in. may be used, the length of the termination would be reasonable for testing cables of higher voltage rating, for example, the length required for a 400 kV peak impulse level would be about 34 in. *M. Darveniza,* B.E., PH.D., *Electrical Engineering Dept., University of Queensland.*

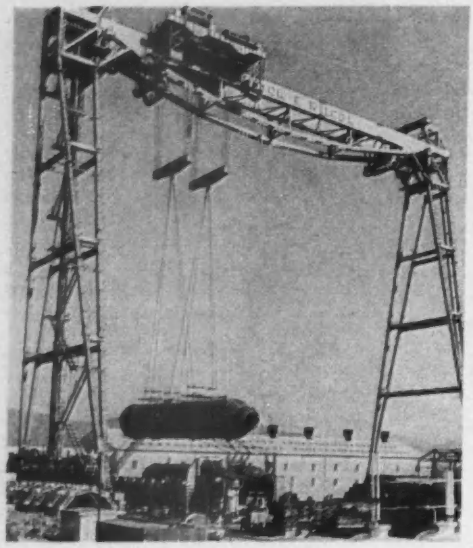


Fig. 1 400 ton Goliath crane lifting completed boiler shell

Progress Report

PRESSURE VESSEL UNDER CONSTRUCTION

LIKE the Forth bridge, the Trawsfynydd nuclear power station site is first apparent from a steel structure rising above the nearby hills. At Trawsfynydd, however, this structure is only a temporary feature. It is the Goliath crane which recently moved into position the first boiler for the No. 1 reactor.

Trawsfynydd station will have two reactors, fuelled with natural uranium, giving an electrical output of 500 MW. The graphite core of each reactor will be enclosed in a spherical pressure vessel, 61 ft internal diameter, and this vessel will be connected through gas ducts to six boilers. Heat will be removed from the 3,720 fuel channels in each core by CO_2 under a pressure of 240 lb/sq in. and with a temperature at the reactor exit of 399°C. From the pressure vessel the coolant gas will be directed through the boilers by circulators running at constant speed and driven by 6,200 h.p. induction motors. Steam generated in the boilers will be supplied to the turbines under two conditions, 927 lb/sq in., 715°F and 290 lb/sq in., 685°F. The four 145 MW sets will be housed in a turbine hall separate from the two reactor buildings. Circulating water for the turbine condensers will be obtained from a reservoir adjacent to the station site, which has been enlarged to meet the station requirements.

Progress on the station is said to have been well maintained and it is not thought that there will be delay in commissioning the reactors. The lower half of the spherical pressure vessel for the No. 1 reactor is in position, protected from weather by a temporary cover, and fabrication of the vessel top is under way.

Recently, the first boiler associated with No. 1 reactor was hoisted into position and, by the time this has been tubed, it is anticipated that some initial delays in work on the boilers will have been overtaken. The second boiler has been stress relieved and hydraulically tested and the third boiler is ready for stress relieving. Most of the built-in items, such as the circulator ducting, have been placed in the biological shield and erection of the CO_2 ducting is proceeding. The turbo-generator sets are not yet on site but work is well advanced on the turbine house and, with completion of the circulating water conduits, it is expected

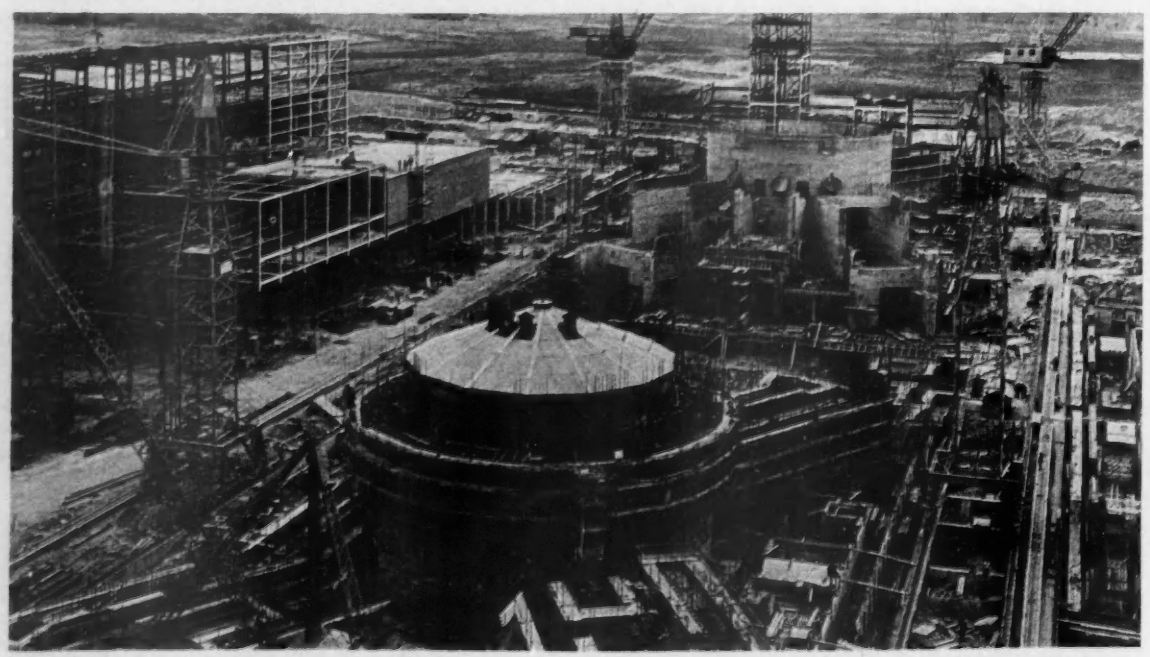


Fig. 2. General view of Trawsfynydd sitework. In the foreground, a reactor biological shield cooling system is under construction and under the temporary roof, work proceeds on the pressure vessel. ... e background is the other reactor building

on Trawsfynydd

FIRST BOILER IN POSITION

that refilling of the reservoir will begin in about one month.

Construction is also well in hand on the 275 kV switching compound which will connect the station to the supergrid and also to the Ffestiniog pumped storage station, five miles to the north, visible from the Trawsfynydd site.

Site Inaccessibility

Trawsfynydd has presented problems to the contracting companies, not only because of the uneven terrain but also because of the site inaccessibility. The station is being built for the CEGB by Atomic Power Constructions and, as one of the principal contractors, International Combustion are manufacturing the boilers, main gas ducting, biological shield cooling system and other auxiliary components. To provide an access road to site sufficient to transport the largest items proved impracticable and, instead, the harbour at Portmadoc, at one time used almost exclusively for slate shipment, has been developed. Components for the boilers are fabricated by International Combustion at their main Derby works and transported by road to Liverpool. They are taken by sea to Portmadoc and then on the final section of their journey to site over 12 miles of reconstructed road via Maentwrog. The largest boiler sections transportable in this way are 18 ft diameter and 9½ ft high. To fabricate the complete heat exchanger, International Combustion have constructed a two-level factory complete with elaborate automatic arc-welding plant, radiographic examination facilities, stress-relieving ovens for the complete boiler shell, and a hydraulic testing bed.

The complete boilers are 18 ft diameter, 109½ ft overall height and weigh 350 tons. In the site factory, the boiler sections are welded together in sub-assemblies, radiographed and then passed to a manipulator section, where the sub-assemblies are welded to form the completed shells. Completed shells are then moved to the workshop apron. The Goliath crane straddles this apron and is used first to lift the shells into the stress-relieving furnace and then to raise them on to concrete plinths for hydraulic testing.

The shells are stress relieved at 600°C for 5 hr, allowed to cool to ambient temperature and then hydraulically tested at 460 lb/sq in. Water for this test is temperature-controlled by circulation through 520 kW electric heaters. After testing, the boilers are positioned by the Goliath adjacent to the reactor vessel. A clean conditions hut is erected over the top of the boiler and work on installation of the heat exchanger tubing carried out from this hut.

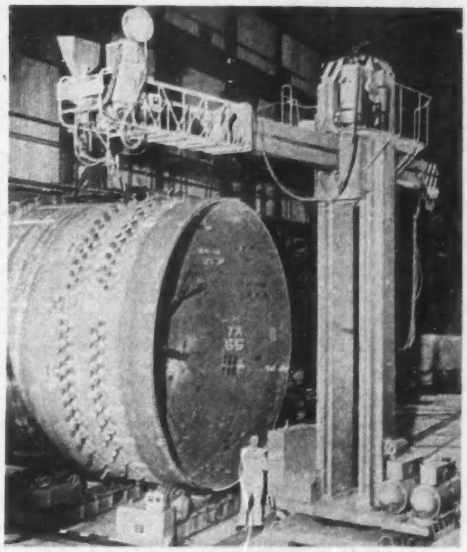


Fig. 3. Boom welder for circumferential seam-welding the boiler shells in site factory

Once the tube elements have been placed in position, the ends of the boilers are sealed and the clean conditions hut removed. The boiler is pressurised with nitrogen to keep out foreign matter until the gas circuit connections to the reactor vessel are completed. When the final boiler welds have been made the full gas circuit, including reactor and boiler vessels is subjected to a pneumatic pressure test.

Factory Facilities

As much fabrication of boiler components as possible has been carried out at the Derby works of International Combustion Ltd, using the 68,250 sq ft heavy engineering shop completed early in 1959. A feature of this shop is provision of a 150 ft long by 25 ft wide by 12 ft deep welding pit which provides good head room for construction of very large diameter pressure vessels.

The press section of the shop is equipped with two vertical presses each of 2,300 tons capacity, which together give a range of plate bending in various width of 3 in. thick (cold) at a minimum diameter of 3 ft up to 4 in. thick (cold) at 25 ft diameter. A four-column down-stroking press of 2,000 ton capacity provides for the hot pressing of dished ends and vessel segments.

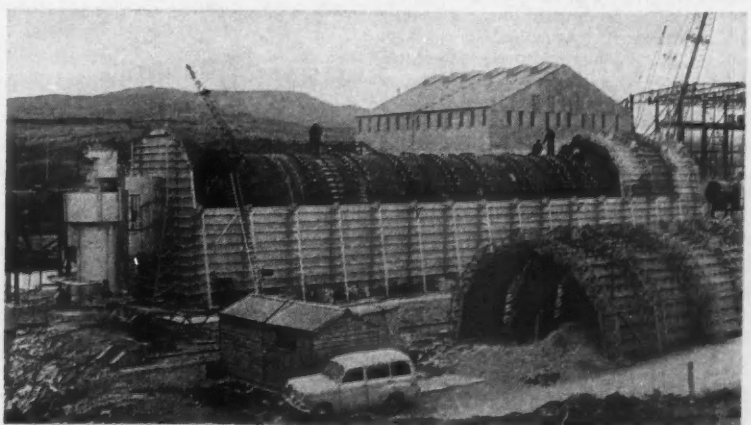


Fig. 4. Boiler shell in oil-fired stress relieving furnace with furnace roof removed for access. Each shell weighs 350 tons and is 18 ft diameter and 109½ ft overall. After stress-relieving, the shells are hydraulically tested on the plinths between the Goliath crane tracks

new products and appliances

Direct reading permeameter

AFFORDING rapid means of checking permeability of magnetic samples, an instrument now available gives direct reading of this characteristic at various values of magnetising field. The instrument, developed originally for measuring permeability of rotors and stators of precision gyroscopes, is suitable for production checking components of any configuration providing maximum dimensions do not exceed the limits of 0·375 in. for thickness and 0·5 in. and 1·75 in. for inside and outside diameters. The particular sample or component is held in a fixture incorporating a primary and secondary winding, the primary producing a magnetising field from a built-in 6 c/s a.c. supply. Induced output from the secondary winding, giving a measure of sample flux density, is amplified, fed to an integrating circuit and passed to a dividing circuit where it is combined with a signal proportional to magnetising AT. Output from the divider is then fed to a 6 in. meter giving permeability readings in six ranges from 10,000 to 400,000, with an accuracy of ±5%. Measurements can be carried out over a range of magnetising fields between 0·015 AT and 60 AT. The whole equipment making up the permeameter is housed in a cabinet weighing 370 lb, with meter and controls mounted on a sloping panel above the magnetising fixture. *English Electric Aviation Ltd., Instrument Wing, Stevenage, Herts.*

Air-cooled industrial valve

HIGH efficiency with low grid dissipation are features claimed for a new industrial triode designed specifically for h.f. heating applications. Capable of operating at frequencies up to 120 Mc/s, the device is forced air-cooled and gives a maximum output of 7 kW when working with a 6 kV anode voltage. Output efficiency at this loading is 78% and grid dissipation is in the region of 80 W, depending upon the impedance of the load circuit. Overall dimensions of the valve are 8½ in. by 4¼ in. dia. *Standard Telephones and Cables Ltd., Brixham Rd, Paignton, Devon.*

Interchangeable amplifiers increase oscilloscope versatility

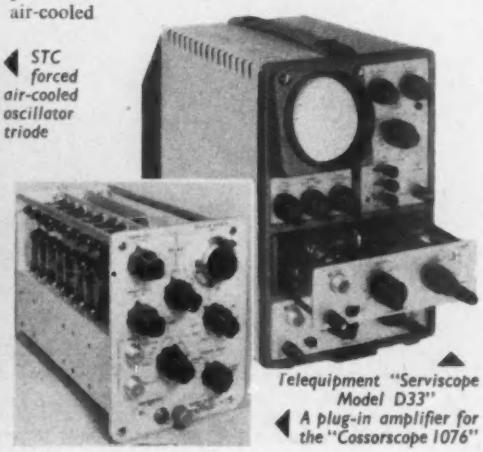
FOLLOWING a rapidly growing trend in construction of electronic equipment, the principle of interchangeable plug-in circuit modules has now been adopted to extend the range and versatility of oscilloscopes. For example, the new "Cossorscope Model 1076" is available with a choice of seven plug-in amplifiers for its "X" and "Y" channels, whose combined characteristics cover a bandwidth from 0 to 60 Mc/s at a sensitivity of 50 V/cm. In addition, the makers can supply "skeleton" plug-in units into which users can build specialised circuitry for applications not catered for by the standard amplifier units. Other features of the instrument include a differential preamplifier giving a sensitivity of 1 mV/cm from 0 to 1 Mc/s and built-in intensity modulated time markers permitting accurate measurement of fast pulse rise times. Basic price of the "1076," complete with two amplifier units, is from £650.

Also incorporating plug-in amplifiers is the latest of the Telequipment range of portable oscilloscopes, the "Serviscope Model D33." This is a lightweight, high performance instrument whose applications range from computer and radar equipment maintenance to measurements in electro-mechanical and electro-acoustical fields. It features a double-beam tube having a p.d.a. voltage of 3,500 V; accessories include a camera attachment and extensible light hood.

A.C. Cossor Ltd., Cossor Hse, Highbury Grove, N.5.

Telequipment Ltd., 313 Chase Rd, N.14.

STC forced air-cooled oscillator triode



Telequipment "Serviscope Model D33"

A plug-in amplifier for the "Cossorscope 1076"

Lighting performance data

TO comply with the recently published IES Code "Recommendations for Good Interior Lighting, 1961," AEI Lamp and Lighting Co. have released a technical data sheet giving most recent performance figures of their equipment. Used in conjunction with the IES publication, the data available should considerably simplify precise planning of lighting installations. *AEI Lamp and Lighting Co. Ltd., Melton Rd, Leicester.*

"Supermatic" without heater

AFTER announcing their wringerless model of the "Countess" washing machine, AEI-Hotpoint have introduced a heaterless version of the "Supermatic" this week. This combination washer/spin dryer includes all features of the existing model, but the control panel has been redesigned without heater control and pilot light. It sells at 84 gn including purchase tax. *AEI-Hotpoint Ltd., 33 Grosvenor Pl, S.W.1.*

Corrosive fluids pump

SUITABLE for corrosive fluids or liquid foods, a recently announced pump makes use of p.t.f.e. for all parts coming in contact with liquid. The pump, which is of the self-priming diaphragm type, has a cast-aluminium body and is driven by a single-phase a.c. geared-motor. The motor has a 7:1 step-down ratio giving the diaphragm a reciprocating speed of 200/min. Diaphragm life is said to exceed 1,000 hours. Having overall dimensions, including motor, of 10 in. by 5 in. by 5 in., pump deliveries quoted for the unit are 2 litres/min. against a 1 ft head and 1·25 litres/min. for a 15 ft head. Inlet and outlet ports of the pump are designed to fit special p.t.f.e. pipe couplers available. *AEI Radio and Electronic Components Division, 155 Charing Cross Rd, W.C.2.*

Water turbidity meter

A DEVICE now available for checking turbidity of mains water required for industrial processes can detect proportion of solid suspension down to a few parts in a million. It consists of a glass sampling chamber, designed for fluid pressures up to 50 lb/sq in., through which a light beam is projected and detected by a photocell unit. Output from the latter is fed to a 6 in. meter calibrated in ten arbitrary units to provide a continuous reading of turbidity variations. If required, the equipment can be used in conjunction with remote alarm annunciator panels available to give visible and audible warning of excess turbidity. *Radiovisor Parent Ltd., Stanhope Wks, High Path, S.W.19.*

Fluorescent fitting

THE "Slickstart" fluorescent lighting fitting referred to last week is also being made and marketed by Atlas Lighting. It is an addition to the "Super Slim" range and costs little more than the standard switchstart models. "Slickstart" does not replace the normal starter switch models, which will continue to be available at the same price; 5 ft and 4 ft fittings are available at £4 19s and £4 2s, respectively, inclusive of tube. *Atlas Lighting Ltd., Thorn Hse, Upper St. Martin's La, W.C.2.*

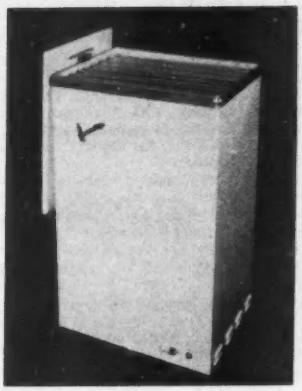
Price variations

PRICE reductions in their range of refrigerators from 5 gn to £19 10s have been announced by Kelvinator to increase home sales and exports. Largest price cut comes to the 9 cu ft model K9MD now selling at 110 gn. Recently introduced, the "Lady K" 3·1 cu ft model now sells at 45 gn, a reduction of 5 gn on its former price. Another large cut has been made to the K77M, a 7·7 cu ft 'fridge which, with a £15 11s reduction, sells at 89 gn.

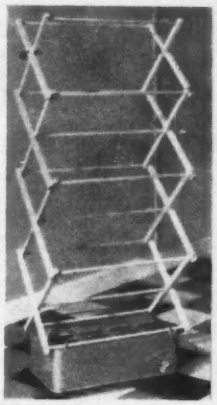
The special summer stocking terms available to wholesalers for the Parkinson Cowan spin dryer and range of fan heaters terminates on 31 Aug.

Kelvinator Ltd., Gt. West Rd, W.4.

Parkinson Cowan Appliances Ltd., Stechford, Birmingham 33.



Left, the Aerialite "Fanfair" clothes-drying cabinet features forced draught drying



Right, selling at less than £3, this new clothes dryer from Flatley will be available in August

Three new clothes dryers

A TRIO of clothes-drying cabinets are now made by Aerialite; two of them have 1·2 kW heating elements and the third is loaded to 1·5 kW. Most expensive of these cabinets is the "Fanfair," which has forced draught created by a fan and sells at £13 10s. It has three-button control and the drying rods are of anodised aluminium. Its fan may be used either with or without the heater. The other two, "Popular De Luxe" and "Babylux," sell at £6 19s 6d and £9 19s 6d, respectively; neither of these models have forced-air drying. Standard in size, these models are 35 in. high by 20¾ in. wide and 15¾ in. deep; finishes are in white or cream stove enamel, the two more expensive cabinets having anodised trims on the top. *Aerialite Ltd., Hargreaves Wks, Congleton, Ches.*

Cheap dryer from Flatley

A COMPETITIVELY cheap clothes dryer from Flatley, selling at £2 19s 6d, will be available at the end of August. It is a rectangular 1 kW convector-type heater with folding clothes rack placed on top. The rack is constructed of ramin wood, which will not warp through wet clothes being placed on it. It has a hammered bronze finish and the price includes purchase tax. *A. J. Flatley Ltd., Irwell Bank Mills, Stoneclough, Radcliffe, Manchester.*

Motorists' aid

OF potential use to the motorist whose car breaks down at night is an emergency lamp with six magnetic strips on the outer casing. Called "Troublelite," this aid comes from Philips and the magnetic strips mean it can be attached to the car's bodywork, leaving both hands free for repairs. It can be used with a normal battery or with a 16 ft lead from 6 V to 24 V car batteries. *Philips Electrical Ltd., Century Hse, Shaftesbury Ave, W.C.2.*

Electronic wire thickness gauge

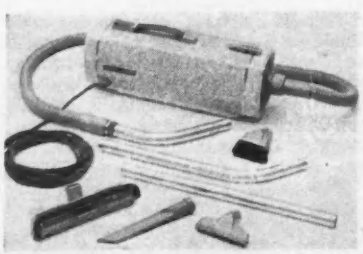
DESIGNED for continuous monitoring of wire thickness during the drawing process, a recently introduced electronic instrument measures change in thickness in terms of capacitance change between wire surface and a gauge head. Signals are fed to an indicator unit via a coaxial lead, change of wire thickness being displayed on a meter calibrated in percentage. Advantages claimed for the capacitive gauge over an electromagnetic type are that it is temperature stable and independent of the effects of vibration and composition of wire material. The instrument is suitable for measuring wires of the thinnest gauge up to diameters of about 0·33 in. Providing wire diameter is uniform, another application of the gauge is measurement of insulation thickness of covered wires. Weighing 45 lb, the indicator unit is suitable for unstabilised mains supplies at 100 V to 120 V or 200 V to 250 V, 50 c/s to 60 c/s. *The Addison Electric Co. Ltd., 10-12 Bosworth Rd, W.10.*

LATEST INTRODUCTIONS FROM M-R

FIRST new product from Morphy-Richards in their silver jubilee year, which begins this week, is a steam-or-dry iron with push-button control. A button control is fitted in the top of a phenolic handle and used to change from steam to dry ironing—or vice versa. The water container holds ¼ pt of water and steam is dispersed through 15 vents in the soleplate. In the front of the handle is an inlet for ordinary tapwater, which can be used, say the makers, without fear of excessive furring. Also on the front of the handle is a selector for any of eight thermostatic settings. Rated at 1 kW and weighing 3½ lb, the iron is priced at £4 8s 6d.

Yet another new appliance in the Morphy - Richards ranges, the "CYL Cylinder Cleaner," features extra ease of mobility. Weighing only 14lbs, the vacuum cleaning cylinder is carried on a combination of chromium - plated runners and phenolic plastics wheels enabling it to glide with minimum effort over both bare and carpeted floor surfaces. The cylinder, which is of steel covered in washable p.v.c. fabric, is also fitted with a carrying handle positioned adjacent to the foot-operated starting switch. Dust is collected in paper dispensers. Main accessory of the cleaner is the ridged carpet nozzle, designed to cope with all types of carpet including the rubber-backed variety. For cleaning hard floors there is a stiff-bristle brush clipping neatly on to the carpet nozzle. Other accessories included in the modest retail price of £18 17s 6d are crevice and upholstery nozzles and a soft dusting brush. The steel-reinforced p.v.c. flexible hose plus aluminium extension rods give a nozzle cleaning radius of 10ft. BEAB approved, the cleaner is powered by a 450 W motor, available in five a.c./d.c. voltage ranges. *Morphy-Richards (Cray) Ltd., 50 Conduit St, W.1.*

Push-button steam control is a feature of the new M-R steam/dry iron



Morphy-Richards cylinder vacuum cleaner

TRADE PUBLICATIONS

BRENTFORD TRANSFORMERS. — Illustrated 24-page booklet giving details of regulators. Brentford Transformers Ltd., Manor Royal, Crawley.

BILL SWITCHGEAR. — New consolidated alphabetical price list, PL561, covering equipment in new catalogue, G561. Bill Switchgear Ltd., Aston La, Perry Barr, Birmingham 20.

JAS. GORDON.—Two new leaflets, one dealing with Mono gas analysis recorders and the second with the Gordon range of pneumatic servomotors and their uses. Jas. Gordon Ltd., Dalston Gdns, Stanmore.

MARCONI.—Illustrated brochure entitled "Solutions to simple radio communication" on communication systems by Marconi Wireless Telegraph Co. Ltd., Marconi Hse, Chelmsford.

MORGAN CRUCIBLE.—Illustrated brochure giving data and applications of Crusilite furnace heating element. Morgan Crucible Group, Point Pleasant, Wandsworth, S.W.18.

N.M.I.A.—Booklet entitled "Iron Casting for Industry" dealing with the properties and varied applications of grey iron castings. National and Midland Ironfounders' Assn., Harborne Rd, Edgbaston.

PYREX.—Illustrated leaflet describing industrial uses of glass in filtering. J. A. Jobling and Co. Ltd., Wear Glass Wks, Sunderland.

RADIOVISOR.—Leaflet describing turbidity indicator and alarm for liquids. Radiovisor Parent Ltd., Stanhope Wks, High Path, S.W.19.

RAPID MAGNETIC LTD.—Leaflet describing radial pole permanent magnetic pulley, "Andox V." Rapid Magnetic Ltd., Lombard St, Birmingham 12.

REYROLLE.—Recently published pamphlet on the Type SGA3 flameproof air-break manually operated circuit-breaker. A. Reyrolle and Co. Ltd., Hebburn, Co. Durham.

S.T.C.—Leaflet detailing uses of Stanofone, a battery operated telephone system. Standard Telephones and Cables Ltd., Industrial Supplies Divn., Footscray, Kent.

SOUTH WALES SWITCHGEAR.—Illustrated booklet with diagrams and monochrome plates giving details of Type US1 33 kV packaged switchgear with single and duplicate busbar. It is intended for distribution and power station extra high voltage duties up to 1,000 MVA and 2,000 A. South Wales Switchgear Ltd., Blackwood, Mon.

TECHNOGRAPH.—Brochure produced to act as a guide for manufacturers of equipment using printed circuitry and also setting out in chart form standard printed circuit tolerances. Technograph Electronic Products Ltd., Eros Hse, 29-31 Lower Regent St, S.W.1.

TRILUX.—Illustrated booklet on lighting fittings by Trilux-Lenze KG, Neheim-Huesten, Germany.

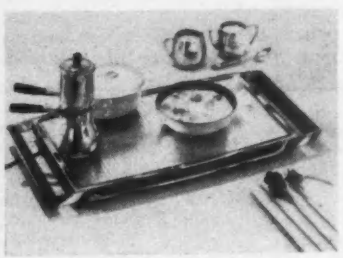
VERMICULATE.—40-page illustrated booklet detailing properties and uses of aluminium-iron-magnesium silicates. Vermiculite Ltd., Barrington Hse, 59 Gresham St, E.C.2.

U.S. Appliance Firms Aim at British Market

AMERICAN domestic-appliance manufacturers are casting their eyes towards the multimillion British market this year. Evidence of this is a US Government sponsored housewares exhibition staged at the US Trade Centre, St. James's St, last week and continuing until 4 Aug. Primary aim of this show is to sound out the British market and appoint agents for their appliances. Many of the firms also hope to set up service centres for their products.

Elegant styling with the accent on eye appeal as well as quality are prime features of the appliances designed to eliminate kitchen chores. Among the larger appliances shown are a range of washers and refrigerators from Westinghouse. They are styled for spacious kitchens, being rather larger than their British counterparts, as is instanced by the 'fridges. The smallest has a 10 cu ft capacity, in comparison with 1·6 cu ft refrigerator in this country.

Novel feature of the Westinghouse iron is a device which enables a spray of steam to be directed ahead of the iron when in use. Another iron finished in white, gold and mirror chrome comes from Proctor-Silex and incorporates a similar device. Models are also available without steam.



Salton's elegantly styled hot tray

There is a marked accent in this exhibition on outdoor barbecue apparatus, and the makers say they hope to educate the British to this form of entertainment. Several of these are mounted on trolleys and use electric motors to rotate the spit. Cooking is usually done by charcoal.

Such accessories as warming cupboards, hoods and magnetic locking devices are often added.

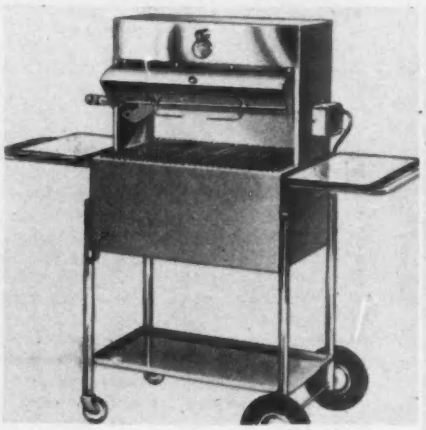
Among the smaller appliances are contemporary coffee percolators in stainless steel and mirror chrome, ranging in size from normal family use to 55-cup capacity urns—all for the home. Popular in America, the electrically heated frypan is expected to find a market here; most of them have accessories and are under thermostatic control. Also in this line are open griddle plates loaded to 1·5 kW which are solidly constructed.

Salton, of New York, have incorporated imaginative design with usefulness in their hot trays, which vary in size from 8¼ in. by 6¼ in. to 52 in. long and 9¼ in. wide. Loadings are comparatively low, the highest being 1 kW.

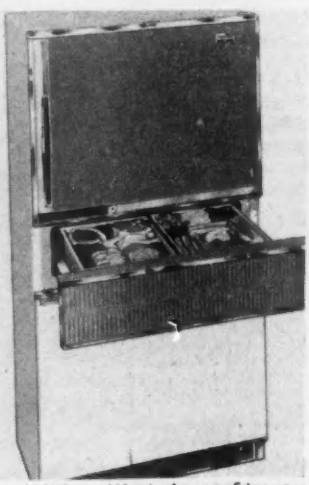
Standard food mixers are less in evidence than portable hand models, which, with fewer accessories, are thought to find a better market.

In general, prices are not quoted in sterling, but those that are appear to be rather higher than equivalent British prices.

Trolley-mounted adaptation of the Salton hot tray



Wilshire charcoal barbecue wagon has electrically rotated spit



Central chiller on Westinghouse refrigerator

News of the Week

S.W.E.B. introduce Safety Testing

Standard fee for Installation and Appliance Tests

COMPREHENSIVE testing of electrical installations and electrical appliances is to be offered by the South Western EB to domestic consumers at modest prices. In a pilot scheme shortly to be introduced in two of the Board's districts, the electrical installation and the appliances in a house of up to ten rooms will be tested for an initial charge of only 30s.

The inspection and tests will be concerned with safety only. There will be no attempt to deal with the adequacy of the installation, or the suitability of the appliances for the job they are required to do.

The test of the installation will cover insulation resistance between poles and between individual conductors and earth; earth-continuity resistance; earth-fault-loop impedance; the effectiveness of earth-leakage circuit-breakers where used; polarity of switches, etc.; and the suitability of main and sub-circuit fusing.

Appliances will be tested to confirm earth continuity, insulation resistance and the condition of flexible cords, with additional attention given to any mechanical or electrical safety device included in the appliances, to ensure that they are functioning satisfactorily.

If any defects are discovered during the inspection, they will be notified to the consumer, and a quotation offered for putting the installation or the appliance into good condition.

Speaking about testing at a meeting of the South Western Electricity Consultative Council, SWEB chief commercial officer Mr R. F. Richardson said the Board had previously advised consumers of the need for regular inspections of their installations, and would be doing so again before long.

New Central Heating Co.

ALL forms of heating are represented in Powell Duffryn Heating Ltd., the new company just formed by the Powell Duffryn group. The company is to operate the business previously conducted by Janitor Boilers, Hurseal, Gulf Radiators and Powell Duffryn Modulair. With Mr M. Reid as chairman, the other directors are: Mr W. H. Sharland, Mr A. C. Hazel, Mr K. M. D. Johns, Mr R. C. Saloway, Mr R. Turner, Mr H. H. Hollesen, Mr R. H. Stewart and Mr E. B. Overton.

Cable firm for sale

SOMEBODY wants to get out of the cable business. An advertisement in the *Financial Times* in the past few days says a manufacturer in the London area of thermo-plastics electric cables, having modern automated extrusion plant supplying Government departments and export, would be interested in discussing possibilities of a merger or sale with parties either in the industry or seeking diversification.

B.E.A.M.A. C.P.A. Formulae

THE BEAMA Council recently approved an amendment to that part of the Supplementary Clause and Formulae relating to variations in "Rates of Pay." There will be no change in that part of the formulae that deals with variations in the price indices for materials. As from 1 July, 1961, the changes are as follows: Sub-clause (a) "Rates of Pay," of the Supplementary Clause and Formulae —for "the first three-fifths of the contract period," read "the first one-third of the contract period," and for "the last two-fifths of the contract period," read "the last two-thirds of the contract period." It should be noted that in the CPA Formulae for Export Contracts, the "contract period" reads "delivery period."

£7.8m. retail chain to liquidate

THE closing down of Clydesdale Supply Co's 130 appliance, TV and furniture stores throughout the country seems imminent following a stunning loss of £817,000 in the year to March, against a £950,000 profit previously. Directors have been seeking a buyer, but though it was rumoured that both Mr Isaac Wolfson and Firth Cleveland were interested, none has materialised and directors now recommend immediate liquidation.

Founded by Mr Israel A. Levine, who died last year, the Glasgow-based business rode to prosperity on the radio boom of the 1920's. Property accounts for £485,000 of the £7·8 million assets.

Holme Pierrepont Rejected

STRONG local opposition on health as well as aesthetic grounds has won the day in the Holme Pierrepont controversy. The Minister of Power has turned thumbs down on the proposal to build a 2,000 MW coal-burning station at the site.

It is noticeable that in his anouncement the Minister does not mention the question of air pollution, which played a major part in the opposition's evidence at the public inquiry at the end of last year. He said his inspectors had advised him that the station would "seriously reduce an area of open country of particular amenity value very near Nottingham, and that the necessary movement of coal by rail to the power station would greatly intensify the city's traffic problems."

Underground Cables for Borrowdale

THERE are to be no overhead power lines in Upper Borrowdale, in the Lake District, after all, and the National Parks Commission has won its point. Although the Minister of Power, following the public inquiry in February, granted permission for an o.h. line from Longthwaite to Glaramara Guest Hse, and in Seatoller, the North Western Electricity Board have now decided to proceed with underground cable throughout. But they are not accepting the offer by Friends of the Lake District of £5,000 towards the extra cost. (The section earlier granted as overhead would have been some 1½ mile to 2 mile of the 6-mile line).

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It is hoped to complete the scheme by autumn, although but for the heavy holiday traffic in the area the task would be completed much earlier. So ends a dispute extending over several years.

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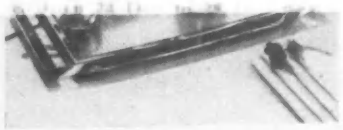
Pye buy into tape recorders

PYE are moving into the tape recorder field, but not so far in the teen-age market. Through their Pamphonic Reproducers Ltd. subsidiary, they are acquiring the interests in the Reflectograph tape recorder, formerly owned by Multisonic Ltd., a wholly owned subsidiary of Multicore Solders Ltd. The Reflectograph, which sells for just over

Elegant styling with the accent on eye appeal as well as quality are prime features of the appliances designed to eliminate kitchen chores. Among the larger appliances shown are a range of washers and refrigerators from Westinghouse. They are styled for spacious kitchens, being rather larger than their British counterparts, as is instanced by the 'fridges. The smallest has a 10 cu ft capacity, in comparison with 1·6 cu ft refrigerator in this country.

Novel feature of the Westinghouse iron is a device which enables a spray of steam to be directed ahead of the



Salton's elegantly styled hot tray

There is a marked accent in this exhibition on outdoor barbecue apparatus, and the makers say they hope to educate the British to this form of entertainment. Several of these are mounted on trolleys and use electric motors to rotate the spit. Cooking is usually done by charcoal.

open griddle plates loaded to 1·5 kW which are solidly constructed.

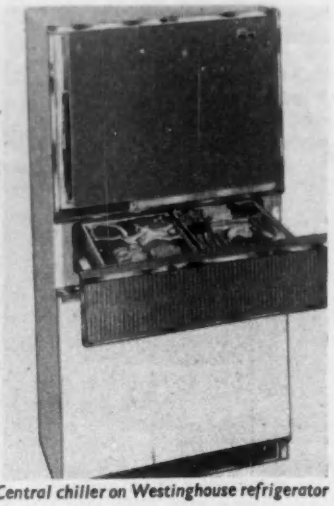
Salton, of New York, have incorporated imaginative design with usefulness in their hot trays, which vary in size from 8½ in. by 6½ in. to 52 in. long and 9½ in. wide. Loadings are comparatively low, the highest being 1 kW.

Standard food mixers are less in evidence than portable hand models, which, with fewer accessories, are thought to find a better market.

In general, prices are not quoted in sterling, but those that are appear to be rather higher than equivalent British prices.

Trolley-mounted adaptation of the Salton hot tray

Wilshire charcoal barbecue wagon has electrically rotated spit



Central chiller on Westinghouse refrigerator

SOVIET EXHIBITION TOMORROW

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If any defects are discovered during the inspection, they will be notified to the consumer, and a quotation offered for putting the installation or the appliance into good condition.

Speaking about testing at a meeting of the South Western Electricity Consultative Council, SWEB chief commercial officer Mr R. F. Richardson said

of the contract period," and for "the last two-fifths of the contract period," read "the last two-thirds of the contract period." It should be noted that in the CPA Formulae for Export Contracts, the "contract period" reads "delivery period."

New Central Heating Co.

ALL forms of heating are represented in Powell Duffryn Heating Ltd., the new company just formed by the Powell Duffryn group. The company is to operate the business previously conducted by Janitor Boilers, Hurseal, Gulf Radiators and Powell Duffryn Modulair. With Mr M. Reid as chairman, the other directors are: Mr W. H. Sharland, Mr A. C. Hazel, Mr K. M. D. Johns, Mr R. C. Saloway, Mr R. Turner, Mr H. H. Hollesen, Mr R. H. Stewart and Mr E. B. Overton.

Cable firm for sale

SOMEBODY wants to get out of the cable business. An advertisement in the *Financial Times* in the past few days says a manufacturer in the London area of thermo-plastics electric cables, having modern automated extrusion plant supplying Government departments and export, would be interested in discussing possibilities of a merger or sale with parties either in the industry or seeking diversification.

£7.8m. retail chain to liquidate

THE closing down of Clydesdale Supply Co's 130 appliance, TV and furniture stores throughout the country seems imminent following a stunning loss of £817,000 in the year to March, against a £950,000 profit previously. Directors have been seeking a buyer, but though it was rumoured that both Mr Isaac Wolfson and Firth Cleveland were interested, none has materialised and directors now recommend immediate liquidation.

Founded by Mr Israel A. Levine, who died last year, the Glasgow-based business rode to prosperity on the radio boom of the 1920's. Property accounts for £485,000 of the £7·8 million assets.

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The five defendants named below intend to appeal, if so advised.

Judgment. Five of the defendants, Mr F. Foulkes (president), Mr F. Haxell (general secretary), Mr R. G. MacLennan (assistant general secretary), Mr J. Humphrey (office manager) and Mr J. N. Frazer (executive councillor), were found guilty of having acted, between September, 1959, and February, 1960, in breach of the union's rules, and conspired together to prevent, by fraudulent and unlawful devices, the election of Mr J. T. Byrne in place of Mr Haxell. His Lordship assessed Mr Byrne's monetary loss at £380, less income tax, to date, and at £346 p.a., less tax, until he received salary of general secretary.

The evidence, direct and circumstantial, and the inferences to be drawn, did not come up to the standard required to find conspiracy against the other nine defendants.

Communist Controlled. In the opinion of his Lordship, not only was the union managed and controlled by the Communist Party, but so managed as to serve the ideals of the party. In 1959 the Communist Party controlled it through Mr Haxell and other communists in the union.

Rules. At the Rules Revision Conference in 1957, a last-minute alteration was made excluding the possibility of appeal against executive council action on election results. His Lordship found Mr Haxell had slipped the matter before the conference, with the help of Mr P. Burns, a former employee. It was a wicked fraud upon ETU members, he said.

Voting Papers. Referring to the 1959 election, it was common ground that 26,833 extra were printed—"a striking and sinister feature of the case." His Lordship was convinced that Mr Haxell not only knew that surplus papers had been sent to head office, but that he caused them to be there and intended fraudulent use to be made of them. The voting situation when head office closed from 24 Dec. to 28 Dec. was: Byrne, 20,363; Haxell, 19,385. His Lordship had no doubt those facts were known to Mr Haxell, Mr Humphrey and Mr MacLennan.

Envelope Switch. On allegations that envelopes from 55 branch returns were destroyed and other envelopes substituted, he found 27 cases established, and a further four cases seemed, on balance of probabilities, to have been proved. Of the 109 branches disqualified, 106 produced a majority for Byrne and the remaining three produced a majority of only three votes for Haxell. None of the three generals of the union could offer any explanation consistent with honesty for such disparity. Nor could his Lordship. But for the compound forms of dishonest trickery, Byrne would have had a majority of at least 1,150, probably 1,500 and possibly more. It was not possible to determine who planned to substitute envelopes. His Lordship was prepared to believe that neither Mr Foulkes nor Mr MacLennan participated in that. It had, in his judgment, the hallmarks of Mr Haxell and Mr Frazer, both of whom he judged to be blunt, unsubtle and ruthless. By whatever means the substitutions were achieved, other persons must have assisted in the posting, with the probability that the communist network was invoked.

Mr Haxell was unconvincing when asked where he was at the material time. Mr Frazer had given a thoroughly unsatisfactory account of having gone on 2 Jan. from headquarters to London to work on correspondence, which he did not produce. Mr Batchelor was suffering from an ulcer and had not given evidence, but he drew 19 gallons of petrol between 23 Dec. and 3 Jan., and also claimed expenses for 19 gallons in that period—he might well have had an opportunity of posting some of the envelopes, his Lordship stated.

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Rolls-Electromatic option extended

THE option by Rolls Razor Ltd. to purchase Electromatic Washing Machine Co., which was to have expired at 30 June last, has been extended pending the finalisation of the accounts of both companies for the year ended 31 Dec., 1960, and for the first four months of 1961.

Manufacture and sale of Rolls-Electromatic machines is proceeding satisfactorily at Cricklewood, they state.

NEW GLASGOW H.V. LAB.

A NEW £70,000 high-voltage laboratory at the Royal College of Science and Technology, Glasgow, was officially opened by Sir John Pickles last Thursday. The laboratory is to be used for advanced research in power generation and transmission.

1,700 all-electric houses for Irvine

SOME 1,700 houses to be built at Irvine are to be all-electric and incorporate electric floor-warming. Of these, 1,400 are for Glasgow overspill, and the remainder for the town's own use. To meet the requirements as well as industrial development in the area, the South of Scotland Electricity Board are to reinforce their network by establishing a new 33/11 kV substation to the north of the town at Ravenspark. This will be fed from Saltcoats grid supply point. The scheme, to cost £156,000, is to be completed by the winter of 1962-63.

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Joint sponsors of the exhibition are the Association of British Chambers of Commerce and the Chamber of Commerce of the USSR, the latter a public organisation whose general aim is to foster business contacts with foreign firms and also to extend trade within the Soviet Union. About 1,000 industrial enterprises of the USSR are exhibiting at Earls Court. Director of the exhibition is a senior official of the USSR Ministry of Foreign Trade.

The exhibition is to be open daily except Sundays from 10 a.m. to 10 p.m. from tomorrow until 29 July. Admission is to cost 3s 6d for adults, children half price.

Stella North wins Hinton Cup

WINNER of the CEGB's "good housekeeping" trophy for power stations has been won by Stella North, in the North Eastern Region. Four other stations in the short list were Marchwood (South Western Region), Roosecote (North Western Region), Meaford "A" (Midlands Region) and South Denes (South Eastern Region). In awarding the Hinton Cup, the judges took account of cleanliness, tidiness, and any special difficulties under which particular stations have to operate, so that over 230 or so power stations in England and Wales, irrespective of size and age, had an equal chance of winning.

Stella North, completed in 1956, has four 60 MW machines and has consistently maintained a high standard of performance, with an annual thermal efficiency never being less than 29·1%.

Announcing the award, Mr E. R. Cooper, CEGB member, said an interesting feature of this year's contest was that three of last year's regional winners again won in their individual regions—Stella North, Roosecote and Meaford.

A new "good housekeeping" prize for transmission sections, called the Hinton trophy, has been awarded for the first time this year by the CEGB. It has been won by the Luton transmission section. Four other sections inspected by the panel of judges were at Preston, Coventry, Wakefield and Carmarthen. The contest is on similar lines to that for the power stations.

OFFICIAL PUBLICATIONS

British Transport Commission, Operations for 1960. Vol. I. Report, 6s. Vol. II. Financial and Statistical Accounts, 16s. HMSO (see page 26).

Additions and amendments to Lloyd's Rules and Regulations for the Construction and Classification of Steel Ships. Notice No. 2182 (Revised Rules for Electrical Equipment and Electric Propelling Machinery) (see page 2).

Patents and Designs (Renewals, Extensions and Fees), 1961. HMSO. 3d.

A Trade in Transition. Reports of S.E. Asia Trade Delegation, 1961. FBI. £1 1s (see page 26).

Building Research, 1960. HMSO. 7s.

BS 1016. Methods for the Analysis and Testing of Coal and Coke. Part 13. Tests Special to Coke. 7s 6d.

Automation Exhibition nearly booked out

WITH a month to go before the closing date for applications, the organisers of the International Instruments, Electronics and Automation Exhibition are doubtful whether they will be able to meet all requests for space. Regular exhibitors have booked 90% of the space and, in addition, 90 new firms are seeking stands for the first time. The exhibition, a biennial event, will be held at Olympia from 28 May to 2 June, 1962.

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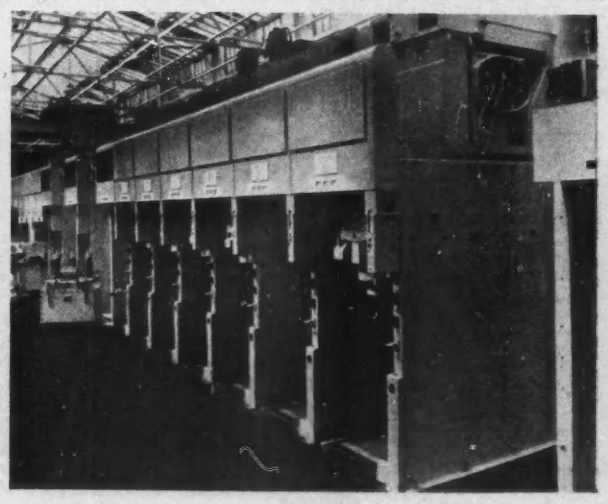
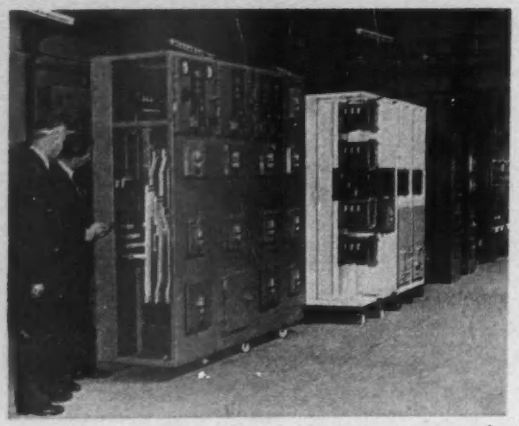
275 kV THAMES CROSSING

ERECTION of the 275 kV line across the Thames between West Thurrock and Northfleet is now expected to be completed by the time the overland supergrid line from Canterbury is finished at the end of September. The two 630 ft towers on either bank of the river were erected some months ago, but stringing of the conductors has been held up pending modifications to the lines based on experience with the Severn River crossing. With the latter lines it was found that the unsmooth exterior of the cables set up an aerofoil effect in a steady wind and the resulting dancing of the lines increased the possibility of clashing. From research quickly instituted it was found that the difficulty could be overcome by substituting a smoother finish to the conductors.



One of the 33 kV switchboards for the main substation at the new Spencer Works of Richard Thomas and Baldwins, under construction at A. Reyrolle and Co's Hebburn Works. It is part of a £1m. contract for 33 kV and 11 kV switchgear and some 3·3 kV equipment. Reyrolle are also supplying 275 kV air-blast switchgear to the CEGB's nearby Whitson substation from which the new steelworks will be fed



First M.V. Switchboard from Scottish Factory

Mr A. R. Creswick, left, chief electrical engineer, British Oxygen Co., with Mr C. J. Reeves, of South Wales Switchgear Ltd., inspecting the first m.v. switchboard made at the SWS Scottish factory in Glasgow, an extension of the range previously made there

RAILWAY PROGRESS IN 1960

TROUBLES of British Railways, both financial and technical, have been so much in the news during the past 18 months that there is little of major importance left for the annual report of the British Transport Commission, published last week, to say that is new. The report does, however, add some details of technical progress, and of financial results.

So far as finance is concerned, the working deficit of British Railways reached £67·7 million in 1960 and to this has to be added £45 million for interest and other central charges. For BTC as a whole there was a surplus, so that the deficit of £112·7 million on BTC account is reduced to £100·9 million for BTC as a whole.

1960 saw important advances in electrification, and the virtual completion of the current plans for diesel multi-unit trains. A feature of the working of diesel trains has been the increase in gross receipts where they have been introduced. This has ranged from 13% to 92% above the corresponding steam train figures for the same cross-country routes. The report comments that the increase in receipts on some of the newly electrified services had been most encouraging as well. In the first full year of operation of the London, Sheerness, Ramsgate and Dover electrification, receipts increased by about one-third compared with those of the previous period.

The report goes into considerable detail about BR's growing research effort. Some problems, it is argued, can be tackled only by the operators, not farmed out to manufacturers or co-operative organisations. Included in this category are questions of contact between pantographs and contact wires on electric traction, and of the insulation of bridges. In the development field, there are design problems to solve such as the provision of insulated joints for track circuits where long length welded rails are used.

Fundamental questions being tackled by a new organisation for electric traction work includes not only the pantograph measurements already mentioned, but also the performance of insulators under contaminated conditions and the application of commutatorless motors and modern electronic developments to traction problems.

Statistical summaries issued with the report show that 1,737 million kWh was used for running, lighting and heating trains during 1960, at an estimated cost of £12·4 million. A further 96 million kWh was used for trolleybuses, £14·5 million was spent by the BTC on the generation, purchase and distribution of electric energy, at an average price of 1·742d/kWh. These figures do not include electricity purchased solely for purposes other than traction.

Home Lighting Conference

LIGHTING engineers were inclined to usurp the architect's prerogative in their recommendations for home lighting, in the opinion of Mr Eric Lyons, the distinguished architect. He was commenting on remarks by Mr R. Freeth, that electrical installations, even in new houses today, were not in keeping with the present electrical age when modern lighting and other electrical equipment could do so much to make life easier. The occasion was a conference on "Lighting for the Small Home," coinciding with the display of the British Lighting Council to which we referred last week.

Mr Lyons also suggested that more attention should be paid to the unlit appearance of lighting fittings.

Among the other speakers at the conference, Miss Mary George, director of EAW, said she felt that the health, safety and welfare of the nation could all be improved by better lighting in the home and, if Government improvement grants were directed more to this end, much could be saved under National Health in the treatment of accident cases and neurotic complaints.

Mr A. H. Young, director of Troughton and Young, spoke of the need to get away from thinking that a single fixed ceiling point could provide adequate lighting, and urged the use of double socket-outlets, instead of single ones, in ring-circuits.

The exhibition continues till 28 July.

How to Sell in S.E. Asia

THE SE Asia of today is several times removed from that of Rudyard Kipling, yet too many British firms are still using the old trading methods. This emerges from the report by a delegation which visited the area in April, under the chairmanship of Sir Edward Thompson. Nevertheless, there have been some brilliant successes, and the decline in Britain's share of trade over the past few years is due more to changed circumstances than any fault of British businessmen. Nor is Britain complacent about it, as evidenced by this delegation, jointly sponsored by the BoT and the FBI, and the amount of work achieved by the various missions into which the delegation split up. They say the changed circumstances demand a new look at the market, and set the example in a thorough-going manner.

In this region, with several newly independent countries suspicious of exploitation, an export drive along the lines adopted in American or European markets would be out of place. Patience and understanding are among the first attributes of successful British suppliers. The more easily won gains are in Malaya, because of its ability to pay, North Borneo and Sarawak because they are British, and Thailand because it is a free market though tariffs are high in common with most of the area. Winning contracts in Thailand is very much a matter of close contact with the market and personalities, and the same might be said of Burma.

The Philippine market is dominated by the Americans and uses US electrical standards, but importers are beginning to realise that UK equipment is substantially cheaper. Another advantage is that English is the commercial language, but as in Burma, Japanese reparations have influenced trade.

Larger than Europe, Indonesia is worth a special look on account of its 92 million population and its natural wealth. They have been substantial buyers of electrical equipment lately, with both Russia and the US among the suppliers. Generating capacity is only around 300 MW at present, but there are plans to more than double this in the next five years. Orders depend largely on being on the doorstep.

Colour TV Practice

THREE countries in the world have public colour television services, the PMG told the House of Commons last week. In the USA, after seven years of colour service, there is about one colour set in 100; in Japan, one in 7,000; while in the USSR, colour is seen on sets installed in "Palaces of Culture." Prices of colour TV sets overseas are about £210 in the USA and between £420 and £520 in Japan.

In view of increasing interest in colour TV, the Television Society has organised a refresher course consisting of six lectures, to be given on consecutive Monday evenings from 18 Sept. Fee for members, £1 1s; non-members, £2 2s.

Automation essential, says Minister for Science

AUTOMATION is a necessity to Britain's national future, Lord Hailsham, Minister for Science, said at the opening of a meeting organised by the British Conference for Automation and Computation last week. Britain could not rely on her established technical skills, against people with lower standards of life who were fast mastering many of the simplest production techniques.

The future depended on seizing the lead in industry design, technology and salesmanship. Above all, this was a question of brains and forethought.

The advantages Britain possessed which had to be exploited included greater scientific knowledge, a higher level of general and technical education and "already sophisticated standard of engineering." The aim was to remain at least one move ahead at every stage in engineering development.

The conference, with the theme "Automation—Men and Money," was largely concerned with the human aspects of automation in industry and commerce. In this context, Lord Hailsham commented that the stage had been reached where automation was no longer a word of suspicion. However, if suspicions of essentially progressive changes were to disappear entirely, it was important that the nature of the operation should be well and humanly explained to all who were in any way concerned.

The essence of automation was not the substitution of machinery for skill; it was the development of more skill in the use of machinery. The end would be more opportunities for skilled labour and an enhanced status of labour. "To an alert and forward-looking industry, automation should involve headaches, but not heartaches."

Lord Hailsham criticised the present weakness of the educational system as regards studies in the fields of human sciences and, in particular, management studies. A thorough going consideration of the subject by the universities was needed.

Electrical Sales Steady

Electrical shops held their own in May, but the seasonal rise evident in the preceding couple of months levelled off. Final estimates by the BoT show that sales of hardware and electrical goods in May were about 5% higher than the corresponding credit-squeezed month a year earlier. But h.p. debts to household goods shops declined slightly to £306 million in May.

MANUFACTURERS BUSY

THE wheels of the electrical engineering industry are gathering speed to meet the influx of orders for heavy equipment received from the CEGB and the world's industrialists since the beginning of the year. This is reflected in the BoT's latest production estimates, which indicate that the output of electrical goods in March was 4% higher than in February, adjusted for the number of working days, and 12% higher than in January. But because things are not so bright on the consumer goods side, March's production was still slightly lower than a year ago.

In the first quarter of this year, the growth in electrical engineering output matched that of mechanical engineering, after lagging behind for several months. When the effects of the present troubles in the car industry become apparent, the mechanical industry will have a job to keep pace. Separate estimates are not yet available for April, but for the combined industries, production had dropped back to just above the February level. Order books were 9% above January, despite large deliveries.

PETBOW ACQUIRE VERNONS' FACTORY

RATIONALISATION in a highly specialised sector of the electrical engineering industry takes place this week with Petbow Ltd., of Sandwich, Kent, acquiring the Liverpool factory operated by Vernons Industries Ltd., along with the manufacturing rights of the Vernon range of aircraft ground starting equipment, high frequency alternators, converters and other apparatus.

Over the past ten years Petbow have concentrated on production of both mobile and stationary a.c. generating equipment from 3 kW to 500 kW, most particularly using Rolls-Royce engines where possible, together with the new range of marine generating sets which have already been ordered for a considerable number of ships. These vary in outputs from 60 kW to 250 kW in both d.c. and a.c. 50/60 cycle outputs.

Vernons Industries Ltd., on the other hand, who were formed in 1942 by Mr Vernon E. Sangster, a director of Vernons Pools, have in the past decade built up a large business in the design and manufacture of all types of 400 cycle aircraft ground servicing and starting equipments for all the latest fighting service aircraft as well as civil aircraft, together with a wide range of equipment for testing aircraft. London Airport are among the customers.

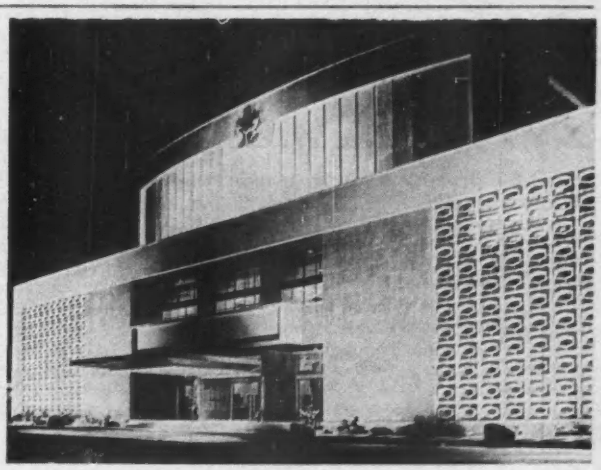
Petbow will continue to operate the Liverpool plant, retaining the existing personnel. Both factories will be able to benefit from the experience of the other and in many instances each factory will be able to manufacture equipment for the other on a quantity basis. Petbow claim that they will now be able to offer the world's most comprehensive range in their field. Price of the deal is not disclosed, but on the latest information available, paid capital of Vernons Industries is £100,000. The company's only factory is the one at Liverpool.

Telegraph pole 1 ft from 11½kV line

A MEMBER of a British Railways Telegraph Dept. gang was electrocuted while working near Llanwern station on a 30 ft pole, the cross-bar of which was within 12 in. of an 11 kV cable, it was stated at the inquest at Newport (Mon) recently. Returning a verdict of accidental death, the jury added a rider that, in their opinion, if there had been co-operation between the authorities involved, the accident would not have happened.

Mr F. R. O'Connell, in charge of the erection gang, said in court he knew the cables were power cables, but did not know their voltage. He thought at the time that it was quite safe to erect the pole in that position. But he had no written or standing instructions as to how near to power cables he could go when erecting poles.

For the South Wales Electricity Board, Mr M. J. Williams said that when seven days' notice was given, the Board could arrange to cut off power while repairs or other work were in progress.



Atlas floodlighting equipment was used in the illumination of the Nigerian National Assembly and other Government buildings in Lagos. General purpose wide and narrow beam projectors were used. Nigelec carried out installation work in co-operation with the Atlas agent in W. Africa

NEW I.O.M. STATION

A NEW diesel power station of the Isle of Man Electricity Board was inaugurated at Ramsey last week by His Excellency the Lieutenant-Governor. Installed is one 2,000 h.p. Mirrlees/Brush set. The h.t. switchboard was supplied by Switchgear and Cowans Ltd., and the main transformer by Hackbridge and Hewittic Electric Co.

CHOICE OF HEATING OFF-PEAK

THE argument that the off-peak tariffs of the South of Scotland EB can be useful to a wide range of electrical house-heating methods is presented powerfully in a booklet recently issued by the Board. Called "Central Heating for the Home by Off-peak Electricity," it relates various forms of heating to the three sets of restricted hours for which special rates are offered in South Scotland.

Centre of the book is a set of typical costs for various types of house and heating systems. A modern detached villa with floor-warming to provide heat in dining-room, lounge, kitchen and hall is reckoned to have a heating load of 6·5 kW, involving a capital cost of £97, and to cost £40/year to run. Oil-filled radiators in a modern bungalow, to give heating in dining-room, lounge, hall, bathroom and two bedrooms takes 12 kW at £290 initial cost and £50 annual running cost.

Suggestions are given in the book for suitable applications of the following heating systems: floor heating, embedded wall panels, oil-filled radiators, tubular heaters, carpet underlays, small-bore central heating and low-pressure hot-water systems. Both installations in new houses and conversion jobs for existing property are dealt with.

L.E.B. CABLE ORDER

PIRELLI-GENERAL Cable Works Ltd. have concluded a £167,000 contract with the London Electricity Board for the manufacture, supply and installation of cables between Sydenham Pk and Churchfields Rd. It comprises some 20,000 yd of three-core 0·25 sq in. 33 kV oil-filled and auxiliary cables.

Sayings OF THE WEEK

"The Government's policy in depressing home market sales in order to increase exports is mistaken, and is in fact having precisely the opposite effect." . . . MR N. F. T. SAUNDERS, managing director, Kelvinator Ltd.

"It is quite easy to bring a group of people out on to the streets. Any fool of a shop steward or official can do that, but it takes a better one to get them back." . . . MR J. MATTHEWS, general secretary, General and Municipal Workers' Union.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, July 4

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	228½	−5½
,, (3 months)	233	−4½
LEAD, refined pig, 99·97% purity (cash)	65	−⅞
,, (3 months)	66	−1
TIN, refined, min. 99·75% purity (settlement)	912	−16
(3 months)	916	−14½
ALUMINIUM, ingots 99·99·5% ...	186	—
,, wire bars (4×4×54")	193½	—
BRASS Strip 63/37	198½	−5½
SILVER (Troy oz)	79½d	—
ZINC, virgin, min. 98% purity (cash)	78½	−¾
,, (3 months)	79½	−⅞
RUBBER, per lb. No. 1, RSS, spot	24½d	+½d
c.i.f. basis, ports, Sept. ...	24½d	+½d
ARMOURING: Galv. Steel Wire (0·104 in.) ...	67½	—
Mild Steel Tape (0·04 in.) ...	53*	—
NICKEL (home)	660	+60
MERCURY (76 lb flask)	66	−1
AMERICAN PRICES: Copper, electrolytic (per lb) ...	31c	—
Lead, (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

HOUSEHOLDERS IN N.W. USE 14% MORE ELECTRICITY

CONSUMPTION of electricity by householders in the North Western area spurted ahead in the past year, almost catching up to the national average. In a preliminary report on their activities for the 12 months to 31 March, NWEB say average consumption per household rose from 1,830 units to 2,092. This is an increase of 14%, against only 5% in 1959-60. Figures for consumption per consumer throughout the country as a whole are not yet available but, including new consumers, domestic consumption in England and Wales rose by 17.6%. Last winter's mild weather is no explanation for the sudden rise in household use of electricity in Manchester and parts north.

One pointer to the rising consumption per head is the growing acceptance of floor-warming. At the end of March there were in the N.W. area more than 10,000 dwellings either occupied, under construction or programmed with this form of central heating.

Industrial activity in the area was at a particularly high level, consumption rising by 10.2%, from 9,081 million units to over 10,200, against a national average of 8.2%. All-round consumption in the area rose by 12%, which is equal to the corresponding national average. Even in this area, where industry accounts for almost half of the total consumption, the relative importance of the domestic sector is growing.

During the year, 25,500 new consumers were connected, bringing the total to over 1,670,000. Of the new supplies all but 2,000-odd were domestic and 800 were farms.

TIN PRICE SPIRALS

ELECTRICAL manufacturers are greatly perturbed at recent events in the tin market where the price has jumped some £90 since early April. A peak of around £935 a ton was reached last week, since when the price has tended to ease a little, but even this figure will add considerably to many manufacturers' costs. Buffer stocks held by the International Tin Council to regulate sharp fluctuations in the price of the metal above £880 a ton were soon exhausted last month in an attempt to stop the enormous rise. The Council has discussed the problem and is again considering the matter this week, but it seems that, in view of the continuing demand for supplies, an early easement of the position will only come with the release of some of the 4,000 tons in US Government stocks.

News in Brief

Belfast Corporation is to erect a £265,000 substation to supply the plant of the BP Oil Refinery (N. Ireland) Ltd. at Sydenham.

Sheffield City Council Highways Committee have approved plans for an illuminated fountain on the Town Hall Square traffic island (to cost £9,000) and the Estates Committee have approved a scheme for floodlighting all four frontages of the City Hall (at a cost of £3,000).

The second Electrical Engineers' Exhibition dinner is to be held at Grosvenor Hse, W.1, on 28 Sept. next. Tickets, price £2 2s each.

North Eastern Electricity Board have rejected a request by the Peterlee Parish Council for the establishment of a showroom there.

Allen West and Co. are supplying electric motor control gear for four new 11,000-ton cargo vessels being built for Alfred Holt and Co.

Annual general meeting of the Central London Productivity Association will be held at 12 noon on 14 July at 21 Tothill St, S.W.1.

The Royal Society of Arts is again offering prizes in an Industrial Art Bursaries competition, including two for lighting fittings and one for domestic electric appliances.

Out of 3,000 requests for research reports issued by the National Engineering Laboratory, East Kilbride, under 200 came from Scottish industry. The Government regard this as disappointingly small, a House of Commons questioner was told last week.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Peace River Shares

The British Columbia Electric Co. has substantially increased its share interest in the Peace River Power Development Co. Of the 20 million shares authorised, 12,942,086 have been issued. Of these, 5,573,912 are held by Wenner-Gren BC Development Co., the largest individual shareholder. BC Electric's subsidiary, Western Development and Power Ltd., has increased its interest to 2,486,514 shares, and the next largest shareholder is Associated Electrical Industries Ltd., with 884,000 shares. Mr Bernard Gore holds 880,660 shares. Other British shareholders are British Insulated Callender's Cables Ltd., Power Securities Corpn. Ltd., Taylor Woodrow (Overseas) Ltd. and Close Brothers Ltd.

Station Opening

The 40 MW Red Rock Falls power station of the Hydro-Electric Power Commission of Ontario was officially inaugurated last month by Premier L. Frost. Built on the Mississagi River, 50 miles east of Sault Ste. Marie, the station is remote controlled from the George W. Rayner station 15 miles up river.

25 MW Plant Ordered

A complete 25 MW power generating plant has been ordered from Canadian Westinghouse by the Algoma Steel Corpn. Ltd. The plant, to include two turbo-alternators, boiler and auxiliary equipment, will supply power to Algoma's new wide-strip mill, where six main driving motors will have a total of 35,000 h.p. The new power generating plant is not intended to supplant Great Lakes Power Co. as the company's source of electric power, but to augment the supply and level out the peaks. Construction is expected to start early next year.

Japanese Competition

Confronted by intense Japanese competition in the Christmas decorative lighting field, Canadian General Electric are determined to reverse the trend and plan for mass production of lighting sets at 18% to 40% below last year's Canadian prices. In 1960, Japanese firms captured 65% of the market, with the result that output of such lights by the CGE dropped from 7½ million to 4½ million. Now the latter company has raised its target to 18 million bulbs and is improving distribution and merchandising in the aim to reduce retail, wholesale and distribution costs.

INDIA

Nuclear Hold-up?

The prospects of American assistance in the construction of India's first 300 MW nuclear power station, at Tarapore, seem to be dwindling, according to reports from informed sources in New Delhi. Two factors which have prejudiced favourable consideration of the project in the USA are said to be the economics of nuclear energy and the supply of enriched uranium. India has so far opposed the safeguards sought by the International Atomic Energy Authority which, in effect, gives the agency or aiding nations control over subsequent programmes undertaken.

PAKISTAN

New Hydro Scheme

Preliminary investigations on the Khanpur Dam proposed to be built on the Haro River, Pakistan, have been completed. It is now considered a feasible proposition. The site of the dam is about 12 miles from Taxila. With the help of the WAPDA engineers, the firm Swissboring has completed its basic investigation, and a report submitted to the consultants for the project, Associated Consulting Engineers, is being studied. It is proposed to build a 130 ft high and 55 ft long masonry dam and erect a 6,450 kW power station.

AUSTRALIA

Two New Stations?

The Queensland State Government have now agreed in principle to the building of new power stations in Central Queensland and on the West Moreton coal field. This followed consideration of a report by the State Electricity Commissioner, Mr N. Smith, on future power generation. This report followed months of investigation into sites and costs by British consultants Merz and McLellan, the State Electricity Commission, and the Queensland Coal Board. These authorities were prepared to recommend power houses at Callide and near the New Hope, Box Flat, and Southern Cross collieries on the West Moreton field. These collieries are in the Blackstone area, South of Bundamba. There seems little doubt that a major power house will be built near the three West Moreton collieries. But the likely site in Central Queensland is still in doubt. There is a possibility of a future aluminium smelter at Gladstone, using bauxite from Cape York peninsula, and a local cheap power source would be an advantage. The State Premier, Mr Nicklin, has already indicated that the large amount of capital required would necessitate a loan from the World Bank or other overseas source to help build the stations.

Hydro Expansion

Under a new plan to increase production of aluminium at Bell Bay, Tasmania, from 12,000 tons to 44,000 tons a year, Comalco Industries Ltd. will need an additional 35 MW of power. On their part, the Government of Tasmania have undertaken to submit a proposal to Parliament in the session which has just opened to authorise the Hydro-Electric Commission to construct an additional source of electric power on the River Derwent. The Bell Bay smelter, which is jointly owned by Comalco Industries and the Tasmanian Government through Aluminium Production Corporation Ltd. (APCO), is currently being expanded from 12,000 tons to 28,000 tons a year. The additional capacity will be fully productive in 1964, although the new hydro-electric scheme may not be operative till 1965.

Kalgoorlie Decision

The Kalgoorlie Electric Power and Lighting Corporation Ltd. has decided to close down its generating plant at the end of 1962. So ends a very unfortunate chapter which has extended over the past ten years. Back in 1950 the company was faced with the loss of custom of two mining companies and, in an attempt to reduce generating costs, it was decided to change over the existing steam plant from wood burning to coal burning; but the capital expenditure involved amounted to over £400,000, compared with £300.000 originally estimated. And, although the new coal plant brought improved efficiency, by the time it was put into service the cost of Collie coal delivered at site had risen from 60s a ton to 132s a ton, of which 62s was freight charge. Loss of the company's larger consumers brought a substantial reduction in output in 1953 and efforts to secure additional loads brought little result. The directors of the company have been unable to reach any agreement for long-term arrangements to supply its major consumers and, in view of the impossibility of operating economically on a much reduced load, have notified all consumers that the station will close at the end of December, 1962.

JAPAN

Research Labs

Claimed to be the largest electrical engineering research laboratory in Asia, the Toshiba Central Research Laboratory being built for the Tokyo Shibaura Electric Co. is nearing completion at Kawasaki. Estimated to cost $15·3 million, it will consist of a four-storey main building with a 886 ft frontage, and six other buildings on a 452,000 sq ft site. Initially, it will be staffed by about 950 research specialists.

Company Activities

MOSTLY quiet on the City front. Not only are markets in want of something to bite upon in the shape of economic good fortune or failure but the summer holidays are taking toll of broker and client alike. After a slippery start last week, which took the *Financial Times* industrial ordinary index down further to 319·4 (against this year's "high" of 365·7 on the 15 May), there was just enough business to take it back up to 322·0 by the close of the first week in the new account.

Electrical shares, too, with little to sharpen their teeth upon tended to soften, a condition also witnessed in the case of Pyrotenax despite their good results for the year to 31 March. As makers of cables they did well to increase their trading profit from £808,133 to £842,841, although the net profit after a larger tax bill was down slightly from £430,994 to £428,506. On the other hand, chairman Sir Brograve Beauchamp has ordained a one-for-three free scrip issue while the dividend and bonus payment totalling 45% exceed last year's dividend of 40%. Response on the Stock Exchange was to mark down the company's 5s Ordinary shares from 61s to 58s 9d although by the week-end they had reclimbed to 59s 9d. Some shadow must, in fact have been cast by Sir Robert Renwick, chairman of Reliance-Clifton and Industrial Products, who was telling his shareholders, on the same day that the Pyrotenax results were announced, that that there was little sign of any real improvement in prices. Although the price war is over, Sir Robert believes that the industry would not be returning to former conditions and that cable making is going to remain a highly competitive business.

Reports that a firmer market is now building up in domestic appliances, although views on refrigerator prospects are mixed, did nothing to bolster the shares of AEI, GEC and English Electric. AEI dropped back over the week from 40s 6d to 39s 9d while GEC slid from 34s 6d to 33s 9d and English Electric settled lower from 34s 9d to 34s. Elsewhere, Decca were marked down from 62s to 59s 9d and Hoover "A" had to give ground from 42s 6d to 42s 3d. Colvern, too, eased 2s 6d to 50s, but Dimplex were one of the very few to show a net rise on the week 9d up at 79s. Among those where scarcely any movement at all was recorded were British Electronic Industries, Thorn, Ultra and Berry's Electric Magicoal.

Elliott-Automation found itself quoted at around 33s 3d by the close of the week's business, against 34s 3d at the start of the week, despite the expansion news.—*From our City Correspondent.*

Alwyn Holdings

A one-for-two scrip issue is being made to shareholders registered on 7 July. Directors say trading is satisfactory and they expect to pay 15% on the increased capital for the year to June, 1961.

Aron Meters

Having weathered the storm, the company is boldly facing up to fierce competition in the meter market and also diversifying into other fields. An imminent step is into the manufacture of cooker timers, under licence, to Lux Clock of Connecticut, negotiations for which are at an advanced stage. Arrangements concerning other Lux products are likely to follow, it is understood.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price†	
			Earned	Paid	High	Low
1957	178,657	63,193	72·3	15	61/3	53/6
1958	129,801	38,486	44·0	15	63/-	53/-
1959	25,160	17,194*	—	15	69/3	44/-
1960	90,397	28,726	30·9	15	92/-	46/9
1961	115,322	31,518	42·3	15	71/-	67/-

* Loss. †Calendar year, except 1961, which is up to 18 May.

The transfer from Kilburn to the recently acquired premises at Aylesbury, where production can be concentrated under one roof, is about to begin. In his annual report, the chairman, Mr E. D. A. Herbert, says results are expected to show a modest improvement over the period of transition during the next two or three years. Thereafter, the board are confident of reaping the full benefit of the major rehabilitation now taking place.

Brazilian Traction, Light and Power

"Serious and prolonged inflation" are the main worry, Mr H. Borden told shareholders at the annual meeting in Toronto recently. The Government will not allow the company to increase tariffs sufficiently to offset the fall in the value of the cruzeiro; with the result that, in dollar terms, earnings have been falling steadily for four years.

Dimplex Ltd.

The company has been advised that its annual meeting for 1961 must be held before 23 July, so the meeting has been set for 21 July, noon, at Southampton.

Drake and Gorham

Earnings have come out better than expected. Profit before tax has jumped from £129,476 to £171,154 for the year to 31 March and last year's 17½% dividend is being matched on capital increased by a rights issue, although this time 2½% is labelled bonus.

Elliott-Automation

The growth of the group continues in terms of orders received, turnover and profits, Mr Rudolph de Trafford, chairman, told the annual meeting last week. He denied a shareholder's suggestion that they were expanding simply for the sake of expanding. Growth was under proper control and development on the right lines, he said.

Marryat and Scott

Profit is again a record at £256,720 before tax (£214,122 in the previous year) and dividend is raised by 5% to 32½%. After tax, net profit comes out at £133,033 (*£106,795*), of which dividends absorb £43,492.

Parkinson Cowan

Group net profit has slumped from £281,148 to £47,648 as a result of a loss by the domestic appliance division, and dividend is cut from 17½% to 11¼%. Prospects are still uncertain for appliances, say directors, so they are negotiating to expand industrial heating activities further, to reduce dependence on the domestic field.

Pyrotenax Ltd.

Shareholders have reason to rejoice at the company's silver jubilee. A 5% bonus is being added to the dividend, making 45% (previously 40%) for the year, and a one-for-three scrip issue is proposed. Trading profit improved from £808,133 to £842,841, but with a drop in other income and higher tax, net profit comes out slightly lower at £428,506 (*£430,894*).

James Scott Electrical

Steady growth in profit and dividend continued in the year to 31 Jan. Payment is up by 2½% to 27½% and pre-tax profit from £226,400 to £250,800. Net profit comes out at £131,851 (*£126,739*).

E. and H. P. Smith

Perry and Sons (Overmantel), makers of plate glass, mirrors and wooden products, are being taken into the E. and H. P. Smith electrical distributing and auto component fold. Price is £138,600, comprising £63,000 cash and 378,000 2s shares.

Sterling Industries

Directors have turned thumbs down on the second bid from Vokes and will communicate with shareholders, before the Vokes' offer closes on 7 July, concerning alternative proposals which would involve the reorganisation of the share capital and the injection of a "substantial amount" of revenue-producing assets. Effective control would pass to those injecting the new assets, but an immediate resumption of preference dividend could be expected, directors state.

Superheater Co.

International Combustion's bid for Superheater has succeeded. Acceptances have been received from holders of over 92% of the Ordinary and over 90% of the "A" Ordinary shares.

Dividend Declared

Electronic Trust. Steady 4% as forecast. Gross revenue increased from £74,772 to £100,046.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

7 July—Manchester C.C. Supply of three pedestrian-operated electric aircraft catering trucks.—See 29 June issue.

8 July—Kesteven C.C. (3) Sign lighting units for motorway signs.—See 22 June issue.

8 July—Lytham St. Annes B.C. Supply and fixing complete with new wiring and switchgear of new lighting fittings at Abattoirs, St. David's Rd North. Borough Engineer and Surveyor.

10 July—Croydon B.C. Rewiring installations at Davidson School, Davidson Rd and Winterbourne School, Winterbourne Rd, Thornton Heath. Borough Engineer, Town Hall, Croydon.

10 July—Dewsbury C.B.C. Alterations to existing installations, replacement of lighting fittings, Wheelwright Grammar School.—See 29 June issue.

10 July—Huddersfield T.C. Supply of 500 synchronous plug-in time switches, 20 A, with solar dials.—Advertised 29 June issue.

10 July—Wallasey C.B.C. Electrical installation in technical school, Leasowe.—See 22 June issue.

11 July—Berkhamsted U.D.C. Erection of street lamps, Westfield estate.—See 29 June issue.

11 July—Dublin C.C. 200 street lanterns.—See 29 June issue.

11 July—Frinton and Walton U.D.C. Supply and erection of 37 concrete columns with side-entry colour-corrected mercury lamps.—See 29 June issue.

11 July—Wallasey C.B.C. Installation of 978 socket-outlets in pre-war Leasowe area houses.—Advertised 22 June issue.

12 July—Cumbernauld D.C. Electrical work in Cumbernauld Hse office extension, phase 4. Applications to Chief Architect and Planning Officer, Cumbernauld Hse, Cumbernauld, Glasgow, by above date.

12 July—Durham C.C. (b) Electrical installation in Jarrow Register Office. Applications to County Architect, South St, Durham, by above date.

12 July—Gosport B.C. Installation of ring main circuits in 96 pre-war council houses. N.I.C. contractors only. Maintenance Officer, Housing Section, Town Hall. Deposit £2 2s.

12 July—Manchester C.C. Complete electrical installation in proposed Canton Grammar School for Boys, Fairweather. N.I.C. contractors only. City Surveyor, City Hall.

12 July—Wallasey C.B.C. Electrical installations in 42 dwellings, Union St.—Advertised 29 June issue.

14 July—Aberdare U.D.C. Supply and installation of new synchronous striking clock to replace existing movement, Hirwaun War Memorial.—See 29 June issue.

14 July.—S. Wales E.B. Installation of rising mains and lateral services to two 11-storey blocks of flats, Sketty Park housing estate, Swansea. Details from District Manager, Strand Offices, Swansea.

14 July—Wexford C.C. Avenue lighting installation, St. Senan's Hospital. N. Mathews and Co., 42 Fitzwilliam Pl, Dublin.

14 July—Wortley R.D.C. Supply and installation of 40 "Highway" concrete columns with "Brampton" lanterns, lamps and control gear for Group "A" colour-corrected lighting.—See 22 June issue.

15 July—Dronfield U.D.C. Supply and installation of lighting and socket-outlet points in 35 houses, Fletcher Ave estate.—See 29 June issue.

15 July—Rochester C.C. Erection of 500 Class "B" concrete columns together with the supply and fitting of equipment.—See 22 June issue.

17 July—Manchester C.C. Electrical installations in 744 houses and flats, Handforth.—Advertised 29 June issue.

18 July—Worksop R.D.C. Supply and installation of two pumps for sewage at rate of 375 g.p.m. against 33 ft head; and two pumps for sludge at rate of 100 g.p.m. against 42 ft min. head.—See 29 June issue.

19 July—Co. Westmeath. (b) Lighting, heating and power installations in St. Mary's Hospital, South Hill, Delvin. Details from consulting engineers: J. V. Tierney and Co., 15-16 Duke St, Dublin. Deposit £10 10s.

19 July—Tandragee R.D.C. Electrical installations in 14 houses, Ballylisk. Engineer and Surveyor, Town Hall, Banbridge. Deposit £2.

20 July—Manchester C.C. Contract 250B. Electrical installations in 68 Hazel Grove dwellings. Director of Housing, Town Hall, Manchester 2.—Advertised in this issue.

20 July—Morecambe and Heysham B.C. Renewal of wiring and ancillary works in Town Hall. Applications, with £2 deposit, to Borough Engineer and Surveyor, Town Hall, by above date.—Advertised in this issue.

21 July—Perth C.C. Supply and installation of 47 units Group "A" sodium lighting, A9, Aberuthven, Blackford.—See 29 June issue.

22 July—Cuckfield U.D.C. Erection only of 40 octagonal street lighting columns and three wall mounting fittings with control gear. Surveyor, Council Offices, Oaklands, Haywards Heath. Deposit £1 1s.

24 July—Sligo. Installation only of electrically heated laundry and cooking equipment and removal of existing steam heated equipment in County Home. County Engineer, Courthouse, Sligo. Deposit £3 3s.

25 July—Belfast. Electrical installation in Lombard Youth Club, Tower St, for Irish Temperance League. Details from consulting engineers McCandless and Barton, 6 Murray St, Belfast 1. Deposit £3 3s.

25 July—Ilford B.C. (a) Erection and connection of approx. 1,200 columns and lanterns; (b) cable laying, jointing and trenching; and (c) thrust boring, in Group "B" street lighting, stage IV.—Advertised 29 June issue.

25 July—Ilford B.C. Removal of 424 trolley bus poles. Borough Engineer, Town Hall. Deposit £2 2s.—Advertised in this issue.

26 July—Larne B.C. Supply and erection of Group "A" fluorescent street lighting at Antiville Rd: 25 2 x 80 W 5 ft tilted lanterns on 25 ft concrete columns and one 3 x 80 W. Borough Surveyor, 8 Victoria Rd.

27 July—Newbury B.C. Supply and erection of 713 Group "B" lanterns, 697 columns and 16 wall brackets, together with lamps, wiring and gear. Borough Surveyor, Municipal Bldgs.—Advertised in this issue.

28 July—N.I. Housing Trust. Electrical installation in three-storey block, Russell Drive, Lurgan. Trust Offices, 12 Hope St, Belfast.

29 July—Weymouth B.C. Supply and erection of 145 Group "A" concrete columns and lanterns. Columns to be octagonal design Stanton Ironworks. Lanterns to be S.O. design manufactured by A.E.I. Lamp and Lighting. Engineer and Surveyor, Town Bridge Hse.

31 July—North Armagh Hospital Management Committee. Installation of wiring, Lurgan and Portadown Hospital. Registered contractors only.—See 29 June issue.

1 Aug.—Lytham St. Annes. Supply and erection of two 3,500 g.p.m. at 19 ft head vertical centrifugal sewage pumps complete with motors, starters and gear.—See 22 June issue.

1 Aug.—Ramsbottom U.D.C. Installation of Class "A" sodium lighting, 20 columns, Blackburn Rd. Engineer and Surveyor, Council Offices.

2 Aug.—Birmingham C.C. Servicing and maintenance work on lifts in public buildings and schools. City Engineer, Baskerville Hse, Civic Centre. Deposit 2 gn.

3 Aug.—Leyton B.C. Supply of primary and secondary bellmouth collecting chambers with electrically operated penstocks for Auckland Rd pumping station. Engineer, Town Hall. Deposit £5.

4 Aug.—Belfast T.C. Supply, delivery and erection of 33 kV and lower voltage cables and accessories.—Advertised 29 June issue.

4 Aug.—Edinburgh C.C. Electrical installation, new police station, Gayfield Sq.—See 29 June issue.

9 Aug.—Wortley R.D.C. Supply and installation of street lighting in five groups. (1) 93 15 ft columns with 80 W mercury lamps; (2) 31 20 ft columns with 125 W lamps; (3) 26 25 ft columns with 3 x 80 W fluorescent tubes; (4) 68 25 ft columns with 250 W mercury lamps; (5) 77 20 ft and 15 ft columns with 125 W and 80 W mercury lamps.—See 29 June issue.

14 Aug.—E.B. for N. Ireland. Specification NI.1635. Supply and installation of 400 V switchgear at Coolkeeragh Power Station.—See 22 June issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 112 queries answered this week

"Genl" lamps—suppliers of? L.E.B.—Lustro Distributors Ltd., 4 Nile St, N.1.

"Bustler" vacuum cleaners—address for spares? T.E.—H. Miller and Co. Ltd., Aston Brook St, Birmingham 6.

"Kaymet" domestic food trolley—makers of? E.E.W.—The Kaymet Co., Kaymet Wks, Sylvan Grove, S.E.15.

"Balex" domestic appliances—makers of? T.A.—Pierre Barthelemy Van Doren, 3 rue de l'Harmonie, Brussels, Belgium.

"Sivia" portable refrigerators—suppliers of? P.J.—Edmundsons Supply Corporation Ltd., 240-250 Ferndale Rd, Brixton, S.W.9.

"Anetn" irons—address for spares? J.E.E.—Brun Electrical Services, 19 Bank Parade, Burnley, Lancs.

"Bull" motors—address for? J.L.—Bull Motors (E. R. and F. Turner Ltd.), Foxall Wks, Ipswich.

"Beryl" electric blowers—makers of? L.D.—Rainville Engineering Co. Ltd., Mill La, Lymington, Hants.

"Metamec" clocks—address for? M.C.—Metamec Ltd., South Green, Dereham, Norfolk.

26 Aug.—Bradford B.C. Installation of electric wiring, three dwelling, Scar Hse Reservoir, Harrogate.—See 29 June issue.

1 Sept.—Cambridge C.C. Supply of electric lamps to council for period of 12 months. City Engineer, Guildhall.

4 Sept.—Northern Ireland E.B. Supply and erection of main generator/generator transformer connections for No. 4 60 MW turbo-generator. Consulting engineers: Kennedy and Donkin, 64 Royal Exchange, Manchester 2. Deposit £5 5s.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

17 July—South Africa. 270 3 A circuit-breakers, Heineman 226s or similar dimensions. Chairman of the Union Tender Board, 291 Bosman St, P.O. Box 2685, Pretoria. B.o.T. (ESB/20894/61).*

18 July—Brazil. Ten rectifying transformer substations. Companhia Carris Porto Alefrense, Avenida Joao Pessoam No. 325, Third Floor, Administration Dept.

20 July—India. Store Department. Cable making equipment. Three STA and S machines; two hydraulic lead presses; two electrically heated die block equipment; one high-speed paper-cutting machine; two floor roll take-up stands; two cable-drum supply stands; eight ten-head insulating machines; six two-unit general purpose twisting machines. Ref. ISD 2310 to 2313 and 2318. Co-ordination Branch, India Store Dept., Govt. Bldgs, Bromyard Ave, Acton, W.3.

21 July—New Zealand. 12 clocks, electric, slave, half-minute impulse, 9 in. dial with hour hand making one revolution in 24 hours. Operate on d.c. 170-270 mA with 4 ohm resistance. Director-General (Stores Div.), G.P.O., Wellington. B.o.T. (ESB/20448/61).*

24 July—India. Repeater power station plant for trunk cable scheme connecting Bombay, New Delhi and Calcutta. Director-General of Posts and Telegraphs, New Delhi. B.o.T. (ESB/20820/61).*

24 July—India. Co-axial line equipment for trunk cable scheme connecting Bombay, New Delhi and Calcutta. Director-General, Posts and Telegraphs, New Delhi 1. B.o.T. (ESB/20821/61).*

27 July—Egypt. 350 kVA standby diesel generator. Director-General, Telecommunications Organisation, Sharia Ramses, Cairo. B.o.T. (ESB/21339/61).*

27 July—India. Five 500 kVA transformers; five 300 kVA transformers; 200 kVA transformers. Kanpur Electricity Supply Administration, Kesa Hse, Kanpur. B.o.T. (ESB/20899/61).*

27 July—Thailand. 75 items of 69 kV transmission line materials. Royal Irrigation Dept. Attention of Thai Liaison Engineer, c/o Engineering Consultants Inc., 1901 South Navajo St, Denver 23, U.S.A. B.o.T. (ESB/20884/61).*

28 July—South Africa. 140 auto cut-in and battery change-over contactors. Chairman of the Tender Board, SAR, P.O. Box 7784, Johannesburg. B.o.T. (ESB/20864/61).*

29 July—Pakistan. 569,000 2 in. paper sleeves, 0·090 in. dia; 516,000 2 in. paper sleeves, 0·115 dia. Mr F. Rizwi, Purchase Co-ordinating Officer, Block 32, Director-General, Posts and Telegraphs, Karachi. B.o.T. (ESB/20872/61).*

31 July—France. 3,600 metres 750 CMNE cable with 36 junction boxes; 7,200 metres 750 CMNE cable; 4,320 metres GEN cable; 90 reels DR8 cable. Purchasing and Contracting Officer, A.F.C.E., Camp Guynemer, Fontainebleau. B.o.T. (ESB/20991/61).*

31 July—France. Ten diesel driven generators, single-phase, 220 V 5 kVA, with 25-50 A circuit-breakers; nine panel boards, four fuses, bipolar 20 A and four plugs, 30 A; 144 wooden panel boards 20 by 30 cm with two terminals 8 mm² 10 A fuses and one 10 A switch. Purchasing and Contracting Officer, Headquarters, A.F.C.E., Camp Guynemer, Fontainebleau. B.o.T. (ESB/20831/61).*

4 Aug.—Malaya. Central Electricity Board. Supply and installation of switchgear, control equipment and cables for new Johore Bahru power station. Ref. EE 1737/4. Crown Agents, 4 Millbank, S.W.1. Fee £10, drawn in favour of Crown Agents.

5 Aug.—Syria. Supply and installation of four passenger lifts, Damascus University. The Secretary, Damascus Univ., Damascus. B.o.T. (ESB/19599/61).*

7 Aug.—Sudan. Supply of 15 tons of insulated cadmium copper wire, 70 lb per mile, to BSS No. 175:1951. Controller, Stores and Workshops, Dept. of Posts and Telegraphs, Khartoum South. B.o.T. (ESB/20850/61).*

31 Aug.—Australia. Three 300 kVA bushing type transformers; eight 300 kVA cable entry type transformers. Secretary, Victorian Railways, Melbourne C.1. B.o.T. (ESB/20656/61).*

4 Sept.—Malaya. Supply and erection of 132 kV and lower voltage cables for Central Electricity Board. Preece, Cardew and Rider, Queen Anne's Gate, S.W.1. Fee £20, in favour of Preece, Cardew and Rider.

Gazette Announcements

COMPANIES ACTS

Thomas Corhall Ltd. Mr R. J. W. Merchant, Bank St, Bury, appointed liquidator from 15 June.

Victoria Electrical Co. (Manchester) Ltd. Mr M. A. Armstrong, Molsey St, Manchester, appointed liquidator from 14 June for the purpose of voluntarily winding-up.

Ladybird Electrics Ltd. Mr K. Wilson, Throgmorton Ave, E.C., appointed liquidator for the purpose of voluntarily winding-up.

Phipps and Culling (Products) Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 10 July. Persons intending to appear to notify A. W. Coleman and Allibone, 20 Kingsway, W.C.2, by 7 July.

F. and B. Electrics Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 11 July, at 2.30 and 3 p.m., respectively.

Victrolec Ltd. First meetings of creditors and contributories to be held at Official Receiver's Office, Somerset Hse, 37 Temple St, Birmingham 2, on 12 July, at 11 and 11.30 a.m., respectively.

Gate Electrics Ltd. Winding-up order dated 19 June.

BANKRUPTCY ACTS

First Meeting and Public Examination

Bradford. M. E. Tippett, retailer of furniture and domestic appliances, formerly carrying on business at Otley Rd, Bradford. Public examination, 10.30 a.m., 10 Aug., County Court, Manor Row.

Appointment of Trustee

Birkenhead. T. A. Craig, electrical dealer, formerly carrying on business at Grange Mount. Trustee: J. R. Hayes, Berwyn St, Llangallen. Appointed from 19 June.

Release of Trustees

Bournemouth. W. E. Beards, radio and electrical engineer, formerly carrying on business at 34 Ashley Rd, Boscombe. Trustee: A. H. Horler, official, Westwood Rd, Southampton. Released from 19 June.

Luton. C. R. Clarke, electrical contractor, formerly carrying on business at Kingham Way. Trustee: C. A. Taylor, official, The Parade, Northampton. Released from 15 June.

Receiving Orders

Wandsworth. R. F. Plews, electronic equipment manufacturer, formerly carrying on business at Northcote Rd, Battersea. Order dated 19 June.

Edmonton. J. C. Brown, electronics engineer, formerly carrying on business at Cormorant Wks, Lett Rd, Stratford. Order dated 20 June.

Edmonton. L. Brown, electronics engineer, formerly carrying on business with J. C. Brown, at Cormorant Wks, Lett Rd, Stratford. Order dated 20 June.

CONTRACTS PLACED

Ealing B.C. Provision of lanterns/lamps/control gear and brackets/control gear box for conversion of filament to sodium lighting, £33,171 and £2,933, respectively, A. C. Ford Ltd

Flintshire C.C. Supply and erection tubular steel columns with 200 W sodium lanterns at A550 Penymynydd roundabout, Abacus Municipal Ltd.

Lewisham B.C. Supply of 503 lanterns/lamps/control gear and 81 columns, £12,567, G.E.C. Recommended.

Luton B.C. Installation of electricity to 70 old people's dwellings, Lewsey estate, £6,339, Williams and Richardson, Luton.

Newcastle under Lyme B.C. Installation of traffic control signals, Friars St/High St, Hassell St/High St, Automatic Telephone and Electric Co. Ltd., £1,850.

Newcastle C.C. Electrical installation, Day Training College, £1,768 11s 11d, T. E. Harrison, Stanhope St. Supply of two-alternator couples set for Rutherford College, £1,855, Reyrolle and Co. Ltd., Hebburn.

Newcastle upon Tyne Hospital Board. Electrical work in Danesfield Maternity Hospital additions, Veale Nixon Ltd., £2,846.

Northumberland C.C. Following contracts placed for installations in schools: J. Reilly, Hexham, Allendale St. Peter's School, £307; F. Reid Ferens Ltd., Newcastle, Kirkley Hall Farm Institute, £256; and Bonham Electric Co., North Shields, Longbenton Balliol County Primary School, £264.

Norwich. Electrical services for central boiler house, Little Plumstead Hospital, £5,494, Norwich Electrical Co. Ltd.

Poplar B.C. Rewiring 15 houses, Baldock St/Ringdale St, £1099, London E.B. Recommended.

Sheffield C.C. Supply of transformers, switchgear and other electrical equipment for Yorkshire/Derwent water scheme, £54,000, Bruce Peebles and Co. Ltd.

Surrey C.C. Provision of electrical services, £18,736, Rivermead County Secondary School, Kingston, Holliday, Hall and Stinson Ltd.

Welwyn Garden City. Supply and installation: 26 Group "A," 48 Group "B" steel lighting columns, lanterns/gear, Abacus Municipal Ltd.

TRADE NOTES

Changes of address. As from 17 July the London office of C. A. Parsons and Co. Ltd. will be at new premises at 40 Broadway, Westminster, S.W.1. Telephone: Whitehall 3984.

C. F. Casella and Co. Ltd. have this week moved to new offices and works at Regent Hse, Britannia Walk, N.1. Telephone: Clerkenwell 8581.

N. Ireland service. Sunbeam Electric Ltd. have opened their first service station and sales centre, at 37 Chichester St, Belfast. Telephone: Belfast 27157.

Teleprinter link. A privately operated teleprinter system now links the London headquarters of Aluminium Ltd. of Canada (Alcan) with its 24 U.K. offices and, via the transatlantic cable, with the Montreal centre of Alcan's extensive North American teleprinter network.

BUSINESS PROSPECTS

Ashton-in-Makerfield U.D.C. Tender: 110 dwellings, Low Bank Rd estate. Clerk.

Ballymoney. Tender: completion of new Ministry of Finance offices, John St; architect, 12 Church St, Coleraine.

Basingstoke. R.D.C. propose 69 dwellings, Cavalier Rd, Old Basing.

Bebington B.C. Tender: hostel block and 23 bungalows, Kennet Rd. Engineer.

Bedlington. Wm. Leech Ltd., builders, St. James's St, Newcastle, propose nine shops and seven flats, Wansbeck estate.

Bewdley B.C. Tender: 101 dwellings, Springhill estate. Pemberton and Bateman, 21 Vine St, Evesham.

Birmingham C.C. Tender: 10 shops, 12 flats over, Wyrley Birch estate, Erdington; 57 dwellings, Short Heath Rd, Erdington. City Architect.

Blackburn. A new training school proposed by Mullard Blackburn Works Ltd., Phillips Rd, Blackburn.

Blyth (Northumberland). Jet Petroleum Ltd., Scunthorpe, Lincs, propose oil distributing depot to cost £350,000 at Cambois.

Boldon. Smith Gore and Co., Little College St, S.W.1, architects for proposed 60 houses, Dipe La, East Boldon for Church Commissioners.

Bristol. Skating rink and bowling centre, Wells St, for Bristol Ice Rink Ltd., to cost £200,000; architects: E. H. Button and Ptnrs., 23 Berkeley Sq, Bristol 8. C.C. Tender: three-bay fire station, Clothier Rd, Brislington; City Architect.

Bury St. Edmunds. Proposed: factory for Barber-Greene, Olding and Co. Ltd., Hatfield, to cost £200,000; architects: Fuller, Hall and Foulsham, 212 High Holborn, W.C.1.

Cardiff. 11-storey hotel, Mill La, Llandaff, proposed by R. Biss; architect: V. E. Parr, 60 Newport Rd, Cardiff.

Carlisle. Johnstone and Wright, 13 Castle St, Carlisle, architects for the £350,000 to £400,000 three-year expansion plan for the Metal Box Co. Ltd. Samuel Jaspers Ltd., English St, propose four-storey departmental store to own plans.

Cheshire. Mechanical units factory and other works at Hooton Park, Wirral, Ches, proposed by Vauxhall Motors Ltd., Luton; architects: Howard Fairbairn and Ptnrs., 81 Piccadilly, W.1.

Chesterfield. T.C. propose £693,020 borough transport depot, Sheffield Rd, Stonegravels. Engineer.

Colchester. Contract worth £200,000 placed with Richard Costain (Construction) Ltd., Westminster Bridge Rd, S.E.1, for factory for Woods of Colchester Ltd.

Coventry B.C. Tender: central swimming baths, Priory St. Architect.

Dalkeith B.C. Tender: 61 houses, Shadepark Housing Dev. Quantity surveyors: Morham and Brotchie, 29 Hanover St, Edinburgh 2.

Darlington. The Newcastle Regional Hospital Board, Benfield Rd, Newcastle, propose development scheme to cost more than £1 million at Darlington Memorial Hospital. The Board's chief architect, P. H. Knighton. Ravenseft Properties Ltd., 52 Charles St, W.1, propose shops, Northgate, to plans by North and Ptnrs., architects, 40 Broadway, Maidenhead. Gt. Universal Stores Ltd. propose three-storey shopping block, Northgate. Architects: North and Ptnrs., 40 Broadway, Maidenhead.

Eastleigh. B.C. propose £22,350 improvements to street lighting.

Ennerdale. R.D.C. propose second stage of trunk road lighting, Distington.

Glamorgan. Monsanto Chemicals Ltd., Victoria St, S.W.1, award £200,000 contract to Sir Robert McAlpine and Sons Ltd., 80 Park La, W.1, for extensions to Forth Chemical petro-chemical plant, Baglan Bay.

Glasgow. Planned: factory extensions/new amenities building for Cooper, McDougal and Robertson Ltd., chemical manufacturers, 255 Lochburn Rd, Glasgow N.W.

Gosforth. A. Cragie and Son, 20 West Rd, Newcastle, propose six-storey flats, Wentworth Grange estate.

Grays. The North East Metropolitan Regional Hospital Board, Eastbourne Terr, W.2, appoint Richard Costain Ltd., Palmers Ave, Grays, contractors for £100,000 outpatients' department proposed at Orsett Hospital.

Grimsby. T.C. propose £103,500 new fire brigade H.Q., Peaks La. Engineer.

Harlow. D.C. plan factory to cost £250,000 at The Pinnacles for Universal Postal Frankers Ltd., Angel Rd, Edmonton, N.18.

Hastings. Proposed: 22-storey block for an hotel on the ground to sixth floors, 88 flats on the seventh to twenty-first floors, three ground floor shops, Yelton Hotel site, White Rock, for N. A. Eccles; architects: Fitzroy Robinson and Ptnrs., 3 Gray's Inn Sq, W.C.1. Two 18-storey blocks each of 96 flats, Woodland Vale Rd, proposed for Newdan Property Investment Co.; architects: Dinerman, Davison and Ptnrs., 13 Perrins La, Hampstead, N.W.3.

Holland C.C. Tender: fire station and six houses, Robin Hood's Walk, Boston. County Architect, Boston.

Ilford. Planned: seven-storey offices, Clements Rd; architects: Braddock and Martin-Smith, East Gallery, St. John's Wood Chapel, N.W.8.

Inverness. Caledonian Bldrs., Citadel, Inverness, propose 60 dwellings, Lochardil, cost £200,000.

Kidsgrove U.D.C. Tender: 24 houses, Gloucester Rd. Engineer.

Lancs. Lancaster and Kendal Hospital Management Committee plan extensions to Royal Lancaster Infirmary, to include a night nurses' home, X-ray and pathological depts.

Leeds. Five shops with flats and a block of 14 flats at Otley Rd, Adel, proposed by West Riding Construction Co. Ltd., The Mansion, Roxholme Grove, Leeds 7. Planned: redevelopment of Empire Theatre site, Briggate, for Industrial and Investment Services Ltd., 129 Finsbury Pavement, E.C.2; architect: D. B. Coombe, 10 Lodge Hill Rd, Lower Bourne, Farnham, Surrey.

Limerick B.C. Tender: 155 houses, Greenhill Tankfield. S. O. P. O'Caeallachain, Rutland St.

Liverpool C.C. Tender: new swimming pool, Speke. Architect.

London. Planned: factory, Bollo La and Sterling Rd, for Lincoln Hair Products Ltd., 55 Strafford Rd, W.3. Offices/stores, Chase Rd, for Patent Die-Casting Co. Ltd., 52 Strode Rd, N.W.10. A laboratory building, Western Ave, for Aircraft Steel Structures Ltd., Western Ave. Proposed: 35-storey office building, Ropemaker St/Moor La; architects: Joseph F. Milton, Cashmore and Ptnrs., 3 (North) King's Bench Walk, Temple, E.C.4. The Chartered Insurance Institute, 20 Aldermanbury, E.C.2, plan extension scheme and office development on both sides of Addle St; architects: T. P. Bennett and Son, 43 Bloomsbury Sq, W.C.1. Guinness, Mahon and Co., 53 Cornhill, E.C.3, plan new building, 3 to 6 Gracechurch St, E.C. Fishmongers' Hall to have £70,000 extensions and alterations; contractors: Higgs and Hill Ltd., South Lambeth Rd, S.W.8. Proposed: shopping development, Rye La, Peckham, S.E.15; architects: Newman, Levinson and Ptnrs., 9 Mansfield St, W.1. Planned: shopping precinct, Gaumont Cinema site, High St, Acton, for E. Alec Colman Group of Companies, 5 Hyde Park Gate, S.W.7. Park Investments Ltd., 98 Park La, W.1, plan eight-storey block of flats, Drayton Gdns, S.W.3; architects: R. Seifert and Ptnrs., 34 Red Lion Sq, W.C.1. A 12-storey office block with basement planned at Buckingham Palace Rd, S.W.1; architect: Morris de Metz, 29 Gloucester Pl, W.1. Block of flats planned, Regent's Park Rd, N.W.1; architects: M. Lyell and Associates, 16 Yeoman's Row, Chelsea, S.W.3. Planned: three shops with six flats above, Old Kent Rd, S.E.1, for D. R. Williams; architects: Nicholson and Rushton, 2 New Sq, Lincoln's Inn, W.C.2.

Lutterworth. R.D.C. propose 36 houses, Jubilee estate, Broughton Astley. Surveyor.

Maidenhead. Block of shops/offices, The Colonnade, proposed to plans by William H. Robbins, architect, 77 Wigmore St, W.1.

Manchester C.C. Tender: 82 dwellings, Moston and Bredbury. Director of Housing.

Morecambe. Proposed new premises for Storey Bros. and Co. Ltd., manufacturers, White Cross Mills, Lancaster; contractor: George Wimpey and Co. Ltd., W.6.

Newcastle upon Tyne. The United Newcastle upon Tyne Hospitals plan developments to cost £4 million at Royal Victoria Infirmary. Proposed by John T. Bell and Sons, Market Chmbrs, Newcastle, to erect a five-storey office block at Archbold Terr. F. W. Harvey, Education Offices, Northumberland Rd, architect for proposed £75,000 Northern Counties College, Longbenton. Proposed: £400,000 new radiotherapy department, Newcastle General Hospital, for Newcastle Regional Hospital Board. Swimming baths, Montague Rd, £233,845, John Twiname Ltd., Cockermouth, recommended.

Northallerton U.D.C. Walter Thompson Ltd., North Rd, awarded contract for 44 bungalows, Priory Close estate.

Northants. Robert Marriott Ltd., Rushden, awarded £275,000 contract for St. John's School, Tiffield.

North Riding. C.C. propose police station, court house, weights and measures offices, Pickering. County Architect, Northallerton.

Norwich. The East Anglian Regional Hospital Board, Cambridge, has appointed E. Boardman and Son, Queen St, architects for medical staff quarters at Norfolk and Norwich Hospitals. Contract for the first stage of the £1 million scheme for redevelopment of St. Stephen St, for Norwich Union Insurance Societies, placed with R. G. Carter Ltd., of Drayton, Norwich; architects: J. Owen Bond and Son, St. Faith's Hse, Mountergate, Norwich.

Notts. £200,000 contract for extensions at Langley Mill, Notts, for Aristoc Ltd., North St, Langley Mill, awarded to S. Sisson and Sons, 79 Granford Rd, Langley Mill.

Nuneaton. T.C. propose £250,000 swimming baths. Surveyor.

Poole. B.C. propose reclaiming and developing 43 acres with café, sports pavilion and 100 flats near Balter and Whitecliff.

Portsmouth. C.C. propose mental health centre, Eastern Rd, Milton. Cost: £116,000.

Salisbury. Hammerson Group of Companies Quadrex Hse, Park La, propose shopping precinct, New Canal/High St.

Sheffield B.C. 86 dwellings, Gleadless Valley estate, £212,802, H. Dernie and Sons Ltd., recommended. 112 dwellings, Gleadless Valley estate, £283,889, J. W. Sivil Ltd., recommended.

Shoreham. Beagles-Mills Ltd., Shoreham Airport, propose development of 6½ acres at Airport for aircraft manufacturing factory.

Shrewsbury. Trust House Ltd., Shorts Bldgs, Drury La, W.C.2, to modernise and extend the Lion Hotel at cost of £110,000.

Skipton U.D.C. Tender: five shops with flats over. Engineer.

Solihull. Proposed: extensions to Rover Co. Ltd. car factory, North Factory site, Meteor Wks, Lode La; architects: Hasker and Hall, 13 Welbeck St, W.1.

South Shields. Murrayfield (Northern Counties) Ltd. plan shops and flats at Market Pl; contractors: John Laing Construction Ltd., New Bridge St, Newcastle. Corporation is recommended to negotiate sale of land at Green St to Wm. Duncan Ltd., of South Shields, for new premises.

Southport. Shops and offices at Lord St are proposed for Lennons Ltd.; contractors: J. Gerrard and Sons Ltd., Swinton, Manchester.

Stockton T.C. Tender: six shops and three flats, Redhill Rd, Roseworth. Borough Architect, The Square.

Business Prospects—continued

Sunderland. Workshops for Sunderland Spastics Society proposed to plans by Newrick and Blackbell, architects, 58 John St, Sunderland.

Surbiton. Block of flats with ground floor showrooms and a public house at St. Mark's Hill planned by Donaldson and Co., 75 London Rd, Kingston.

Teignmouth U.D.C. Tender: theatre and conference hall, Carlton Terr. Architects: Louis de Soissons, Peacock, Hodges, Robertson and Fraser, 12 Baring Cres, Exeter.

Torquay. Planned: an hotel and 84 flats, Grand Hotel site, Torbay Rd, for Western Counties Hotels Ltd.

Walsall B.C. 80 dwellings, Darlaston Rd site, £147,722. F. A. and H. Taylor, recommended.

Whitchurch (Hants). New factory proposed for R. Sandwith Ltd., Bracknell.

Whitefield. Park Lane Development Co. (Bingley) Ltd., Bingley, Yorks, plan 12 shops at Hillingdon Rd and Park La.

Widnes B.C. Tender: 46 flats, Ditton Neighbourhood Unit. Architect.

Wigan. B.C. propose 142 houses, old people's hostel and flats, Bottling Wood.

Wiltshire. C.C. propose primary school, Kiwi Barracks, Bulford and primary school Bovington Camp.

Winchester. £100,000 office block proposed in Brooks re-development area.

Wolverhampton. Extensions costing £61,000 to be erected for Manifoldia Ltd., at Bromford Lane. Contractors: T. Elvins and Sons Ltd., Naden Wks, Soho Hill, Birmingham 19. A warehouse covering 130,000 sq ft proposed at Fordhouses by H. F. Spencer and Co. Ltd., iron, etc., Eagle St, Wolverhampton; main contractors: T.G. Construction Co. Ltd., Ettingshall, Wolverhampton; cost: £87,000. Nine-storey hotel, Bell St, proposed at cost of £250,000. Clivol Properties, Bearnett Hse, Penn, Wombourne, Wolverhampton.

Worthing. Planned: 80 dwellings, Roedean Rd, by Church Farm Development Co. (Lancing) Ltd. Read and Loveless, 727 Christchurch Rd, Boscombe, architects for Nottingham and Walton Trust proposed shops/showrooms, The Boulevard. Five shops/flats, Broadwater St West, proposed by Brighton, Worthing and District Property and Investment Corpn.; architects: L. H. Fewster and Gamble, 5 Liverpool Gdns. Planned: eight shops with flats, Broadwater St West, for Brighton, Worthing and District Property and Investment Corporation Ltd., 14 Grand Parade, Brighton 10; architects: Fewster and Gamble, 5 Liverpool Gdns, Worthing.

Wrexham B.C. Tender: 28 dwellings, Ashfield Rd, Connor Cres. Engineer.

MEETINGS TO NOTE

FRIDAY, 7 JULY

RUSSIAN TRADE FAIR, Earls Court, until 29 July.

ELECTRICAL INDUSTRIES BENEVOLENT ASSCN. A.G.M. 11.30 a.m., Electricity Council, Winsley St, W.1.

MONDAY, 10 JULY

A.S.E.E. (Central London). "Modern Motors and Their Control," by courtesy of Brook Motors Ltd. White Hall Hotel, Bloomsbury Sq, W.C.1. 7.15 p.m.

TUESDAY, 11 JULY

GREAT YORKSHIRE AGRICULTURAL SHOW, Harrogate, permanent Showground site, until 13 July.

WEDNESDAY, 12 JULY

A.S.E.E. (Luton). "Colour Television," P. S. Carnt, G.E.C. Research Laboratories, Luton College of Technology, Park Sq. 8.15 p.m.

THURSDAY, 13 JULY

A.S.E.E. (S.W. London). "Electric Motor Control Gear," R. F. Mathieson, Electrical Apparatus Co. Ltd. Prince of Wales Hotel, S.W.19. 7.45 p.m.

E.A.W. (London). Visit to Food and Cookery Centre, 39 Queen's St, E.C.4. 2.15 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Cambridge Electrical Co. Ltd., 59 St. Andrew's St, Cambridge. Nom. cap.: £100. Dirs.: James McCarthy and Harold W. Gore.

Capable Electrics Ltd., 6 Surrey St, W.C.2. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Stanley H. Lucas and Francis A. Dean.

Centre Electrical Co. (Ealing) Ltd., Morris Hse, 1-5 Jermyn St, S.W.1. Nom. cap.: £100. Dirs.: Richard Eden and Mrs Catherine Eden.

Centrolon Ltd., 76 Valley Drive, N.W.9. Wholesalers and manufacturers of electronic and electrical supplies, etc. Nom. cap.: £100. Permt. dirs.: David K. Burrows, Geoffrey Van-Hay and Gerald M. J. Rosenthal.

Electrolyte Co. Ltd. To carry on business of manufacturing, assembling, operating, developing and dealing in electrolytes of all kinds, batteries, etc. Nom. cap.: £5,000. Dirs.: to be appointed by subs. Subs.: Lance N. F. Mackling, c/o S. Hindmarsh, 45 Markham Sq, S.W.3; and Wm. L. V. Roxburgh.

End and Williams (Mail Order) Ltd., 44 Brazennose St, Manchester 2. Dealers in electrical equipment, etc. Nom. cap.: £1,000. Dirs.: Harold End and Richard L. Williams.

EUK Catering Machinery Ltd. Nom. cap.: £100. Dirs.: not named. Subs.: Norman W. Middleton, 5 St. Gabriels Ave, Sunderland; and Hugh Middlemiss.

Fletcher and Bickerton Ltd. Electrical engineers, etc. Nom. cap.: £5,000. Dirs.: Sam W. Fletcher, 11 The Bridle Path, Ash Bank, Stoke-on-Trent; and Harold Bickerton.

Friston Electronics Ltd., 25 Church Rd, Richmond, Surrey. Nom. cap.: £100. Dirs.: George A. P. Gordon and Hildegard M. Gordon.

Golden Rule Electronics Ltd., South View Laboratories, Seven Stars, Littlington, Cambridge. Nom. cap.: £500. Dirs.: to be appointed by subs. Subs.: Malcolm R. Chettleburgh and Olive I. Chettleburgh.

Roland Graham Ltd., 32 Baker St, Middlesbrough. Electrical engineers, etc. Nom. cap.: £100. Dirs.: Roland Graham and Doreen Graham.

Jackson and Nicholls Ltd., 78 North End, Croydon, Surrey. Manufacturers of electrical precision mechanisms, etc. Nom. cap.: £100. Dirs.: Dennis E. Jackson and Ernest J. Nicholls.

Lowe Bros. (Electronics) Ltd., 52-4 Gray's Inn Rd, W.C.1. Nom. cap.: £5,000. Dirs.: Fredk. J. Lowe and George Lowe.

C. Anthony Nichols Ltd. Electrical engineers and contractors, etc. Nom. cap.: £500. Dirs.: Charles A. Nichols and Mrs Mary E. Nichols, 23 West Hill Way, N.20.

Packardex (London) Ltd., Balfour Hse, Finsbury Pavement, E.C.2. Vendors and manufacturers of television and electrical appliances, floor polishers, refrigerators, etc. Nom. cap.: £100. Dirs.: Robert Sarkin and Henry C. Rudolf.

Park Farm Electric House Ltd., 5 Moreton Ave, Great Barr, Birmingham 22a. Electrical contractors, etc. Nom. cap.: £2,500. Dirs.: Beatrice M. Pulley, Ronald Pulley and Stanley W. Mettles.

Prompt Electrics Ltd. Details similar to Capable Electrics Ltd.

R. D. Electrical Appliances Ltd., 769 Finchley Rd, N.W.11. To carry on business of vacuum cleaner dealers, etc. Nom. cap.: £100. Dir.: Daisy G. Cottle.

Rexwood Ltd., 11 Dryden Chmbrs, 119 Oxford St, W.1. To take over the business of dealers in electrical equipment of all kinds and motor-car accessories carried on at Dryden Chmbrs, W.1, as "The Buckland Organisation," etc. Nom. cap.: £2,000. Dirs.: to be appointed by subs. Subs.: Robin S. J. Buckland and Karol Mrozek.

Richardsons of Hadleigh (Electrics) Ltd., 293 London Rd, Hadleigh, Essex. Nom. cap.: £100. Dirs.: Harry P. Richardson, Peter S. Baldwin and Rae R. Baldwin.

M. D. Roe and Co. Ltd., 17 Nebworth Cl, Shirley, Solihull, Warwicks. Engineers, manufacturers of electrical, electronic, mechanical, hydraulic and other mechanisms, etc. Nom. cap.: £500. Dirs.: Thomas J. Penney and Mrs Marie D. Penney.

Rose Electrics Ltd., 1 Halford St, Leicester. Electrical engineers and general electrical installation contractors, etc. Nom. cap.: £2,000. Dirs.: Geo. A. Bonsell, Joseph E. Gray and Shirley A. Bonsell.

Paul Simmon Ltd., 35 Northgate, Halifax. Electricians, electrical engineers, etc. Nom. cap.: £100. Dirs.: Paul Simmonds and Mrs Edna M. Simmonds.

Slee Semi-Conductor Equipment Co. Ltd., Lanier Works, Hither Green La, S.E.13. Nom. cap.: £20,000. Dirs.: Kenneth V. Slee, Bramwell J. Pridmore-Smith, Alfred W. Porter, Patricia H. B. Slee and Fredk. E. Stead.

Spalec Ltd. Manufacturers of and dealers in domestic electrical apparatus, etc. Nom. cap.: £1,000. Permanent dirs.: Thomas Boulton, 2 Eagle Parade, Buxton; Derrick Bramwell; and Raymond Oliver.

Speedwell Electrical Co. (Stockport) Ltd., 31 Lloyd St, Manchester 2. Nom. cap.: £4,000. Dirs.: George Potts and John K. Potts.

Taylor, Wall and Co. (Nigeria) Ltd., Heantun Hse, Salop St, Wolverhampton. To carry on in Nigeria and Africa generally the business of electricians, electrical contractors, etc. Nom. cap.: £5,000. Dirs.: Stanley F. Wall, Magnus A. Oki and Rodney D. Taylor.

Telecolour Ltd., 26 Christchurch Rd, Bournemouth. Electrical and television engineers, etc. Nom. cap.: £100. Dirs.: Donald H. Crisp and Oswald H. Tramontini.

"The Limes" (Electrical Engineers and Contractors) Ltd., 44 The Ropewalk, Nottingham. Nom. cap.: £500. Dirs.: Peter Bartys and Frances Bartys.

Thomas and Valentine Ltd., 27a Brazennose St, Manchester 2. Electrical engineers, etc. Nom. cap.: £100. Dirs.: Trevor Thomas and John A. Valentine.

Verulam Lighting Ltd., 2a Victoria Parade, Victoria St, St. Albans, Herts. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £100. Dirs.: Gloria Isaacs and David Cornell.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Ardente in design. 782,380. Class 7. Motors. 782,381. Class 10. Hearing aids and electro-medical apparatus, etc. Ardente Acoustic Laboratories Ltd., 8-12 Minerva Rd, Acton, N.W.10.

Carrier in design. 797,818. Class 7 and 797,819. Class 11. Drying apparatus/machinery for use with paper and/or board making machinery, etc. Carrier Eng. Co. Ltd., 24 Buckingham Gate, S.W.1.

Chelmac. 813,734. Class 7. Mixing machines, pumps, etc., for use in chemical industry. Chemical Equipment Eng. Ltd., Castle St, Macclesfield.

E.A.R. 797,616. Class 9. Sound recording and reproducing apparatus, etc. Electric Audio Reproducers Ltd., The Square, Isleworth, Middx.

Valentine in design. B780,408. Class 11. Deep-fat frying apparatus, etc. Comptoir des Machines Société Anonyme, Terreaux 18 bis, Lausanne, Switzerland.

Vapormatic. 772,054. Class 9. Apparatus incorporating electrodes for use in automatically controlling the operation of motors. Lee Guinness Ltd., Crawfordsburn Rd, Newtownards, Co. Down, N. Ireland.

Can you beat that, Mr. Jones

When he's in the mood, Mr. Jones certainly gives those drums a beating. That's what they're made for, of course . . . to help him, and thousands of other jazz enthusiasts, to enjoy life to the full. As a matter of interest, though, pressure die castings play quite an important part in *everybody's* enjoyment of life. They are an essential part of an endless variety of consumer products as well as many musical instruments.

Wolverhampton pressure die castings offer manufacturers of all kinds of products, high quality components at remarkably low cost in a variety of pleasing finishes. And the massive scale of production that can be achieved helps everyone to enjoy a higher standard of living. Wolverhampton pressure die castings point to progress in a big way. Your enquiries would be welcomed.

THE WOLVERHAMPTON DIE CASTING COMPANY LIMITED

GRAISELEY HILL, WOLVERHAMPTON

TEL: WOLVERHAMPTON 23831

THE SIGN OF QUALITY
EMB
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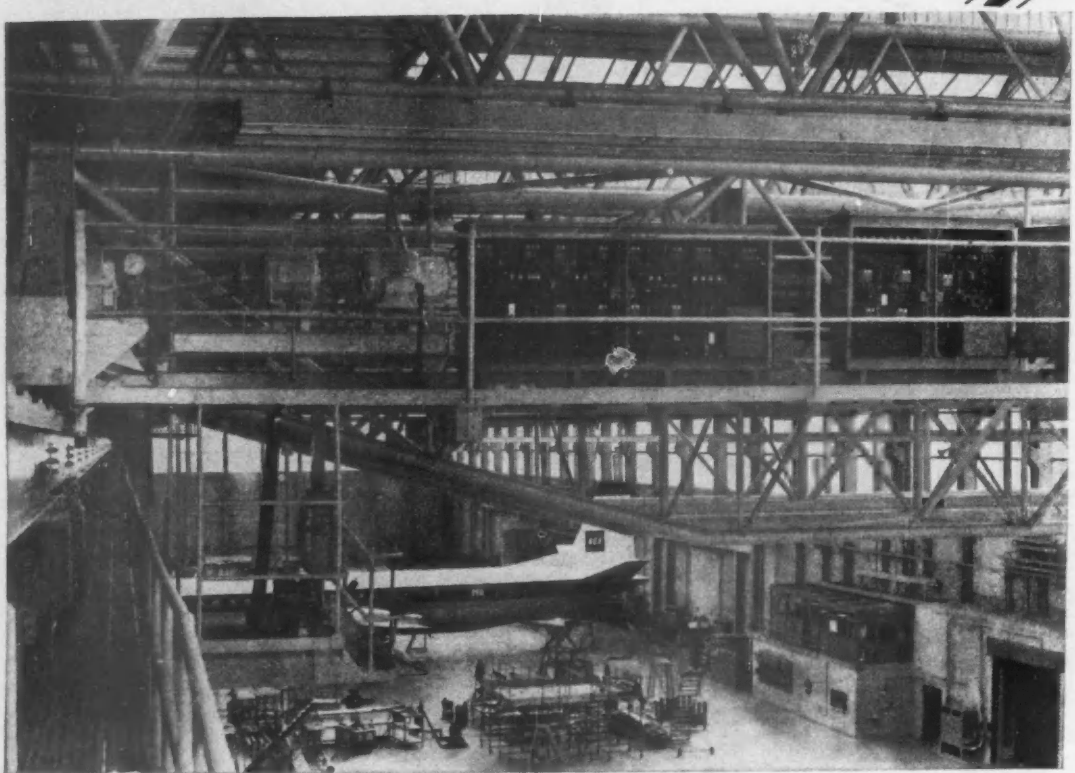
Control Gear



BEA ENGINEERING BASE, LONDON (Heathrow) AIRPORT

RELIABILITY must always be the main consideration in air travel, not only from the safety point of view but also from the economics of aircraft maintenance.

The combination of E.M.B. Contactor Control Gear on this carruthers crane at the B.E.A. Engineering Base at London Airport takes care of this aspect so far as crane handling is concerned.

The E.M.B. MICROsens used in conjunction with the control gear give the creep speeds so necessary when dealing with this type of refit.

E.M.B. Co. Ltd.

WEST BROMWICH
Phone: WESt Bromwich 1171
ENGLAND

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

CITY OF MANCHESTER HOUSING COMMITTEE

TENDERS invited (returnable noon, 20 July, 1961) for Electrical Installations at the following:

Contract 250B: HAZEL GROVE, 68 dwellings.

Particulars and documents from Director of Housing, Town Hall, Manchester 2. (B 339)

BOROUGH OF NEWBURY

Group 'B' Electric Street Lighting Scheme

TENDERS are invited for the supply and erection of 713 Lanterns, 697 Steel and Concrete Columns and 16 Wall Brackets, together with Lamps, Wiring and Control Gear.

Form of Tender, Specification and Bill of Quantities may be obtained from the Borough Surveyor, Municipal Bldgs, at whose office plans and general conditions may be inspected.

Sealed Tenders endorsed "Tender for Group 'B' Lighting" must be delivered to the undersigned not later than Thursday, 27 July, 1961. The Corporation does not bind itself to accept the lowest or any tender.

LESLIE SOUTHERN,
Town Clerk.
(B 338)

BOROUGH OF MORECAMBE AND HEYSHAM

Proposed Renewal of Electric Wiring System and Ancillary Works, Town Hall

ELECTRICAL Contractors desirous of tendering for this work are requested to submit their names and addresses with a deposit of £2 to the Borough Engineer and Surveyor, Town Hall, Morecambe and Heysham, within 14 days of the appearance of this advertisement.

C. E. BOTTOMLEY,
Town Clerk.
30 June, 1961. (B 337)

BOROUGH OF ILFORD

Removal of Trolley Bus Poles

TENDERS are invited for the removal of approximately 424 No. Ex London Transport Executive trolley bus poles.

Forms of tender may be obtained from the Borough Engineer, Town Hall, Ilford, on payment of £2 2s deposit, which will be returned upon receipt of a bona-fide tender not subsequently withdrawn.

Tenders in a plain sealed envelope, bearing no name or mark indicating the tenderer and endorsed "Tender for removal of trolley bus poles," must be delivered to the Town Clerk, Town Hall, Ilford, not later than 4 p.m., on 25 July, 1961.

The Council does not bind itself to accept the lowest or any tender. (B 340)

APPOINTMENTS VACANT

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
WOKING DISTRICT

SALARY: £825/£940 per annum under N.J.B. Class G, Grade 11. Superannuable. This appointment occurs in a rapidly expanding urban and rural district. Applicants should have minimum qualifications of the Ordinary National Certificate in

continued in next column

continued from previous column

electrical engineering and should have had general engineering experience preferably in the electricity supply industry. Consideration will be given to a private car allowance and, in appropriate circumstances, to assistance with housing.

Applications, quoting ET and naming two referees, on forms from District Manager, Seeboard, 4 Chobham Rd, Woking, by 26 July, 1961.

SUB-AREA COMMERCIAL OFFICER
MID-SUSSEX

The sub-area commercial officer in Mid-Sussex retires at the end of this year and applications are invited for the post.

Applicants should preferably be Chartered Electrical Engineers. The person appointed would be directly responsible to the Sub-area Manager for the co-ordination of commercial staff and activities in the sub-area, and should have extensive practical experience in load development, contracting and the operation of showrooms.

Salary in accordance with Class D, Grade 5, of the N.J.M. and H.E. Grades Committee, commencing at £2,380 per annum and rising to £2,595 per annum.

Applications to the Mid-Sussex Manager, Seeboard, Mid-Sussex Hse, North Rd, Brighton, in a confidential enveloped marked "Sub-area Commercial Officer" by 4 Aug., 1961.

SENIOR DEMONSTRATOR
DORKING AND EPSOM DISTRICT

Salary within the range £700 x £25—£775 per annum under N.J.C. Grade 2. Superannuable. Applicants should hold a recognised qualification in domestic science and the E.A.W. Certificate and be prepared to work anywhere in the Dorking and Epsom district. They should be experienced in giving talks and demonstrations on all types of domestic apparatus and will be required to assist in training and in general showroom work.

Applications, quoting ET, on forms from District Manager, Seeboard, 56 South St, Dorking, by 19 July, 1961.

GEORGE WRAY,
Secretary.
(B 327)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

FOURTH ASSISTANT ENGINEER
TRANSMISSION DEPARTMENT
ROTHERHAM

APPLICATIONS are invited for the appointment as a Fourth Assistant Engineer, Rotherham Transmission Section.

Applicants should preferably have had some experience of the maintenance and operation of high voltage (132 kV and above) transmission systems and technical qualifications to Higher National Certificate standard.

The successful applicant will be required to reside in the Rotherham locality.

The salary for the appointment will be in accordance with Grade 11 BX, Schedule B, of the National Joint Board Agreement (£900/£1,165 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 17 July, 1961. (B 316)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

SECOND ASSISTANT ENGINEER
(CONSTRUCTION)

DUTIES will include the specification, design and construction of indoor and outdoor substations for underground and overhead transmission systems operating at voltages up to 66 kV, and negotiations with plant manufacturers.

Applicants should have an all-round general knowledge of substation plant and experience of field construction.

Salary: N.J.B. Class N, Grade 7 (Scale 15), £1,650/£1,830 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield 1, not later than 21 July, 1961.

No. 6 (Hull) Sub-Area

HULL DISTRICT
FOURTH ASSISTANT DISTRICT ENGINEER

Applicants should have had a good general and technical education with practical training in planning, construction, operation and maintenance of underground and overhead systems.

The successful candidate will be required to reside within the District and undertake standby duties.

Salary: N.J.B. Class K, Grade 11 (Scale 8), £1,040/£1,165 per annum.

Sub-Area Headquarters

DEMONSTRATOR OR ASSISTANT
DEMONSTRATOR

Candidates should have had domestic science training, including housecraft, and should preferably hold the E.A.W. Certificate or Diploma. They should be competent to lecture and advise consumers on the utilisation of domestic electrical appliances and be able to give demonstrations with a sales emphasis. The successful candidate will normally be located at Hull, but may be required to work throughout the Sub-Area if occasion demands.

Salary: Demonstrator, N.J.C. Grade 1, £600/£700 per annum; Assistant Demonstrator, N.J.C., £265/£565 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 21 July, 1961.

No. 4 (Leeds) Sub-Area

LEEDS NORTH WEST DISTRICT
FOURTH ASSISTANT DISTRICT ENGINEER

Applicants should have had some experience in the design, construction, operation and maintenance of h.v. and m.v. urban distribution systems.

Salary: N.J.B. Class G, Grade 11 (Scale 5), £825/£940 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 21 July, 1961. (B 322)

MIDDLESEX COUNTY COUNCIL

Main Drainage Dept.

ELECTRICAL ENGINEER

REQUIRED at Mogden Wks, Isleworth, for supervision of maintenance and installation of L.T., D.C. and A.C. motors, generators, switchgear, cable work and general electrical services. Should hold M.O.T. first-class certificate or equivalent and must have held responsible post. Ability to control labour and deal with unusual problems in development work essential. Commencing salary according to qualifications and experience: APT. III, £1,005/£1,185. Possibility of housing accommodation. Prescribed conditions. Applications (two referees) to Chief Engineer, Middlesex County Main Drainage Dept., P.O. Box No. 7, Isleworth, Middlesex. (Quote G.702, E.T.) (B 329)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointments:

STATION SHIFT CONTROL/BOILER SHIFT CONTROL ENGINEER
PETERBOROUGH GENERATING STATION
(NORTHANTS)
(S.V. No. 1519)

Salary: N.J.B., Class F, Grade 10, Scale 5, £825/£940 per annum, plus Shift Allowance.

Applicants should have reached the standard of the Ordinary National Certificate in Electrical Engineering, or its equivalent, and had experience in the operation of a switchboard at a generating station and be fully conversant with high voltage switching operations and protective systems. Experience in the operation of pulverised fuel fired steam raising plant will be an advantage.

The successful applicant will be required to interchange the duties of Station Shift Control Engineer and Boiler Shift Control Engineer.

GENERAL ASSISTANT ENGINEERS
GOLDINGTON GENERATING STATION
(BEDFORD)
(S.V. No. 1520)

AND

GENERAL ASSISTANT ENGINEER
PETERBOROUGH GENERATING STATION
(NORTHANTS)
(S.V. No. 1521)

Salaries: N.J.B. within the range of £625/£805 per annum, plus £90 per annum shift allowance whilst engaged on shift duties.

The commencing salaries will depend upon the duties and responsibilities.

Duties of the above post include assisting in the electrical control room and experience in the technical operation of electrical boiler house and turbine house plant, testing, etc., in a generating station and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

SHIFT CHARGE ENGINEER
WATFORD GENERATING STATION
(HERTS)
(S.V. No. 1522)

Salary: N.J.B. Class E, Grade 7, Scale 7, £965/£1,090, plus London Weighting £50 per annum, plus 10% Shift Allowance.

Applicants should possess experience in the operation of steam generating stations. An apprenticeship and technical qualifications to Ordinary National Certificate standard in electrical or mechanical engineering will be advantageous.

Applications, quoting the appropriate Reference S.V. No., stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 15 July, 1961. (B 307)

CENTRAL ELECTRICITY GENERATING BOARD

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (ELECTRICAL TEST)
FULHAM POWER STATION
Vacancy No. 61/398.

Sound technical training and knowledge of testing and routine maintenance of power station electrical equipment, including generators, switchgear, transformers, motors and protective equipment.

Salary: Class K, Grade 15, £815/£920 per annum.

Applications, quoting vacancy number, may be made (or on form from) Personnel Department, Central Electricity Generating Board, P.O. Box No. 136, London W.1. to be received not later than 18 July, 1961. (B 310)

CITY OF CARDIFF EDUCATION COMMITTEE

Llandaff Technical College

PRINCIPAL: J. COTTERELL
M.I.E.E., A.I.MECH.E., A.M.I.PROD.E.
DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for the post of

LECTURER

in the Department of Electrical Engineering to commence on 1 Sept., 1961, or as soon as possible thereafter. The Department provides Full-time, Sandwich, Block Release, Part-time Day and Evening Courses for Ordinary National Certificate, Electrical Technicians, Electrical Installation, Radio and Television Servicing, Electronic Servicing and servicing for other Departments. The successful candidate will be required to teach electrical engineering subjects in these courses and it would be an advantage if he had experience in the light current field.

Salary in accordance with Burnham Technical Scale for Lecturers: £1,370 x £35 (4) + £40—£1,550. (At present under review.)

Further particulars and application forms can be obtained from the undersigned and should be returned within 14 days of the appearance of this advertisement. Previous applicants will be reconsidered and need not re-apply.

ROBERT E. PRESSWOOD,
Director of Education.

City Hall,
Cardiff. (B 315)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Area:

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
(DEAN FOREST)

The successful applicant will be required for duties in connection with the Contracting and Consumers' Service Section. Candidates should have had experience in estimating for all classes of electrical installation work, the preparation of tenders and specifications. A sound knowledge of installation practice, refrigeration and electrical apparatus repairs, with good commercial ability is necessary. Technical qualifications desirable. Salary: £890/£1,015 per annum (N.J.B. Grade E.8). Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr S. Raybould, Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

Worcestershire Area

THIRD ASSISTANT DISTRICT ENGINEER
(WORCESTER AND MALVERN)

Experience necessary in all branches of distribution work including construction, maintenance and operation of high and low voltage underground and overhead systems and substations. Technical qualifications desirable. Salary: £890/£1,015 per annum (N.J.B. Grade F.9). Apply, by letter, within 14 days, stating age, experience, present position and salary, to District Manager, Midlands Electricity Board, P.O. Box No. 16, Blackpole Rd, Worcester.

F. W. CATER,
Secretary.
(B 306)

ADMINISTRATIVE COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER
£960/£1,310

CANDIDATES must be Associate Members of the Institution of Electrical Engineers or be in possession of the Higher National Certificate and be experienced in the design of electrical installations for all types of buildings. Removal expenses and lodging allowance may be paid to a married man. Apply on form available from the County Architect, 123 London Rd, Leicester. (B 10)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Fife Area

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for appointment as General Assistant Engineer in the Construction Department, East Port, Dunfermline.

Applicants should have a sound experience of all types of overhead construction and be able to carry out surveys.

N.J.B. conditions and salary, Class J, Grade 14 (Scale 4)—£765/£870 per annum; post superannuable subject to satisfactory evidence of health.

Applications on the standard form, obtainable from the Area Manager, South of Scotland Electricity Board, East Port, Dunfermline, should be returned to him not later than Saturday, 22 July, 1961.

East Port,
Dunfermline. (B 311)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

GENERAL ASSISTANT ENGINEER
(CONSTRUCTION)

APPLICATIONS are invited for the above post which requires residence in Caithness for the first 12 to 18 months after appointment. Candidates should have sound technical training and experience in the construction of steel tower overhead lines.

Salary and conditions will be in accordance with N.J.B. Schedule B, Grade 12, £890/£1,015 p.a. Superannuation scheme.

Application forms obtainable from the Secretary, 16 Rothesay Terr, Edinburgh 3, should be returned by 21 July, 1961. (B 312)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Project Group

HINKLEY POINT NUCLEAR POWER STATION

APPLICATIONS are invited from suitably qualified engineers for the post of

THIRD ASSISTANT ENGINEER
(MECHANICAL)

at Hinkley Point Nuclear Power Station Construction Site.

The successful candidate will be required to assist the Site Mechanical Engineer in the supervision of the installation and testing of mechanical engineering plant—conventional and nuclear.

The salary will be within Scale 13 of the National Joint Board Agreement, i.e. £1,320/£1,610 per annum, according to qualifications and experience.

Applications stating age, qualifications, experience, present position and salary, should be forwarded to the Administrative Officer, Central Electricity Generating Board, Southern Project Group, Squires La, Finchley, London N.3, to arrive not later than 19 July, 1961.

Envelopes should be marked "Confidential, Ref. S/61/13."

T. YULE,
Chief Project Engineer.
(B 314)

WAR DEPARTMENT WORKS ORGANISATION

MECHANICAL AND ELECTRICAL ENGINEERS

THIS new civilian organisation, concerned with major works projects at home and overseas, offers 25 pensionable posts to Engineers (men) who have achieved Corporate Membership of Institutions of Civil, Mechanical or Electrical Engineers or have qualified by examination for such membership. High professional attainment may be accepted in lieu of such qualifications.

1 Superintending Grade post, £2,710 (or more)—£3,060.
4 Senior Grade posts, £2,140 (or more)—£2,452.
14 Main Grade posts, £1,506 (or more)—£2,010.
6 Basic Grade posts between £976 (age 25) and £1,308 (or more over age 34)—£1,480.

Outer London salaries quoted. Promotion prospects. Local government, etc. superannuation may be transferred.

Write Civil Service Commission, 17 North Audley St, London W.1, for full particulars and an application form, quoting S/5331/61. Closing date: 9 Aug., 1961. (B 308)

CAMEROONS DEVELOPMENT CORPORATION
in
The Southern Cameroons
require an
ELECTRICAL SUPERVISOR

WHO should be over 30 years of age and must have served a recognised apprenticeship and possess the Ordinary National Certificate in Electrical Engineering. The selected candidate will be in charge of workshops, undertaking the repair and maintenance of industrial and domestic electrical equipment, and will be responsible for maintenance and installation work over a large area. Practical experience of industrial and domestic installations, H.T. and L.T. distribution is required. Knowledge of C.B. and PAX telephone systems and refrigeration desirable.

Minimum commencing salary £1,100 p.a., plus participation in the bonus scheme. Free return passages. Free furnished accommodation and a reasonable amount of free light and fuel. Free medical attention in the territory. Outfit allowance of £80. Children's allowances are payable up to a maximum of two, at the rate of £75 each p.a. Provident fund. Tours of 18-24 months with liberal leave on full pay on completion of tour.

Applicants should send full particulars to the Personnel Officer, Colonial Development Corporation, 33 Hill St, London W.1, quoting Serial 503. (B305)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Glasgow Area

APPLICATIONS for the following superannuable appointments are invited from engineers having technical qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

(1) SECOND ASSISTANT ENGINEER
(METER, TEST AND PROTECTION)
Reference No. GE/46/61.

Candidates should have considerable experience within at least three of the following fields:

(1) The operation of a Class A meter testing station, undertaking the large scale repair, testing and certification of consumers' meters.

(2) Programming and controlling the periodical change of meters in accordance with the Electricity Supply (Meters) Acts.

(3) The pressure testing of E.H.V. cables and apparatus and the location of E.H.V. faults.

(4) The deveolpment and organisation of an E.H.V. power transformer overhaul and test station.

(5) The application of electronic techniques to polyphase metering and supervisory control circuits.

A knowledge of the principles of work study and the ability to apply them to the above problems would be considered an advantage.

Salary: £1,535/£1,720 per annum in accordance with Class L, Grade 6 (Scale 14), of the N.J.B. Salary Scale.

(2) SECOND ASSISTANT ENGINEER
(CONSTRUCTION)
Reference No. GE/47/61.

The duties connected with this post will include the erection and commissioning of large 33 kV primary and 6·6 kV secondary substations, conversion of existing primary substations from 20 kV to 33 kV and cable laying in a congested urban area.

Candidates should have a sound knowledge of building construction, including layout and design of substations, offices and service centres.

Salary: £1,535/£1,720 per annum in dance with Class L, Grade 6 (Scale 14), of the N.J.B. Salary Scale.

The successful candidates for these posts shall be required to reside within reasonable travelling distance of Area Headquarters.

Applications, quoting appropriate reference number, should be submitted on the standard application form which is obtainable from the Area Secretary, South of Scotland Electricity Board, Glasgow Area, P.O. Box 6, 75 Waterloo St, Glasgow C.2, and should be returned not later than Friday, 21 July, 1961. (B 321)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

SENIOR CIVIL ENGINEERING AND BUILDING DRAUGHTSMAN
FOURTH ASSISTANT ENGINEER
DRAWING OFFICE
DIVISIONAL HEADQUARTERS
Vacancy No. 148/61.

APPLICATIONS are invited for the position of Senior Civil Engineering and Building Draughtsman (Fourth Assistant Engineer) in the Drawing Office at this Divisional Headquarters.

Applicants for this appointment should be experienced and qualified draughtsmen, fully conversant with the design and detailing of civil and building works, including R.C. structures and foundations. A knowledge of structural steelwork will be an advantage.

The work is associated with H.V. substations and generating stations.

Salary will be in accordance with Class BX, Grade 9 (£1,005/£1,325 per annum), of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 15 July, 1961.

CIVIL ENGINEERING AND BUILDING DRAUGHTSMAN
FOURTH ASSISTANT ENGINEER
DRAWING OFFICE
DIVISIONAL HEADQUARTERS
Vacancy No. 149/61.

Applications are invited for the position of Civil Engineering and Building Draughtsman (Fourth Assistant Engineer) in the Drawing Office at this Divisional Headquarters.

Applicants for this appointment should be Draughtsmen—experienced on the design and detailing of civil and building works, including R.C. structures and foundations.

The work is associated with H.V. substations and generating stations.

Salary will be in accordance with Class BX, Grade 11 (£855/£1,165 per annum), of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 15 July, 1961.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Administrative Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham.

ASSISTANT SHIFT CHARGE ENGINEER
LINCOLN POWER STATION
Vacancy No. 154/61.

Applications are invited for the position of Assistant Shift Charge Engineer at Lincoln Power Station, Spa Rd, Lincoln.

Applicants should have had a sound technical training and experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class F, Grade 9 (£890/£1,015 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 15 July, 1961.

ASSISTANT PLANNING ENGINEER
WILLINGTON "A" AND "B" POWER STATIONS
Vacancy No. 151/61.

Applications are invited for the position of Assistant Planning Engineer at Willington "A" and "B" Power Stations, P.O. Box No. 27, Derby.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 15 July, 1961.

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These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller.
(B 331)

Eastern Electricity
Chilterns Sub-Area

FIRST ASSISTANT DISTRICT
COMMERCIAL ENGINEER
BEDFORD DISTRICT
152/61.R.

CANDIDATES should have had a good general and technical education and experience in electrical contracting and maintenance work. The successful applicant will be responsible to the District Commercial Engineer for commercial development, supervision of wiring installation work including estimating for all types of industrial, agricultural and domestic installations and such general consumer advisory service as would be anticipated in a District having important industrial, agricultural and housing development. He would also be responsible for operating an efficient maintenance service.

Salary: N.J.B. Class G, Grade 6, £1,190/£1,325.

Apply by letter, to the Manager, Bedford District, Eastern Electricity Board, Prebend St, Bedford, by 21 July, 1961.

ASSISTANT ENGINEER (COMMERCIAL)
HEMEL HEMPSTEAD DISTRICT
155/61.R.

Candidates should have had experience in industrial, commercial and domestic applications of electricity, and should be familiar with tariffs and their application to different classes of consumers. Experience in thermal storage and general space heating of buildings would be an advantage and preference will be given to candidates having a good technical background.

Salary: N.J.B. Class G, Grade 9 (£965/£1,090).

Apply by letter to the Manager, Hemel Hempstead District, Eastern Electricity Board, Bridge St, Hemel Hempstead, by 21 July, 1961. (B 349)

LONDON ELECTRICITY BOARD
ASSISTANT CHIEF ENGINEER
(OPERATIONS)

APPLICATIONS are invited for the position of Assistant Chief Engineer (Operations) on the Headquarters Staff of the Chief Engineer, to take responsibility for the work of the Operations Branch of the Chief Engineer's Department at present located at Alpha Pl, Flood St, Chelsea, S.W.3.

The successful applicant will be responsible to the Chief Engineer for the control, operation and maintenance of the Board's Transmission System together with the installation and maintenance of the Board's internal communication systems and co-ordination of G.P.O. requirements. He will also be responsible for the provision and maintenance of the Board's transport fleet.

Applicants must be Chartered Electrical Engineers with extensive experience of the design, construction and operation of transmission and distribution systems, and also have considerable knowledge of the operation and maintenance of a large transport fleet and internal communication systems.

The commencing salary will be within Class C, Grade 8, of the National Joint Managerial and Higher Executive Grades Agreement, with a salary range of £2,875/£3,100 inclusive of London Allowance.

Applications should be sent direct to the Secretary of the Board at 46 New Broad St, London E.C.2, to arrive not later than Monday, 24 July, 1961. (Ref.: PER/V/3350/T.)
(B 326)

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Region
North Thames Division

APPLICATIONS are invited for the following appointment in the GENERATION DEPARTMENT (CONSTRUCTION SECTION) at Cockfosters (N. LONDON).

DRAUGHTSMAN
(S.V. No. 1517)

Salary: N.J.B. Class AX, Grade 14, Scale 4, £735/£920 per annum (inclusive of London Weighting).

The duties of the successful applicant will include the preparation of drawings under supervision, of mechanical and electrical works associated with high voltage transmission lines and substations.

Applications, quoting reference S.V. No. 1517, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 15 July, 1961. (B 319)

CENTRAL ELECTRICITY GENERATING BOARD
South Thames Division
ELECTRICAL ENGINEER'S DEPARTMENT
CROYDON DISTRICT
FOURTH ASSISTANT ENGINEER
(SERVICES)
Vacancy No. 189/61.

CANDIDATES must possess Higher National Certificate in Electrical Engineering or equivalent qualification, and be interested in automatic protective gear and control gear associated with major electrical plant in power stations and substations.

Salary: N.J.B. Grade 11, £940/£1,215 per annum, including London Allowance.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 12 July. (B 318)

J. & P.

ASSISTANT CHIEF DRAUGHTSMAN

Switchgear Dept.

Johnson & Phillips Ltd. invite applications for the position of Assistant to Chief Draughtsman. Applicants must have practical and D.O. experience in Industrial Switchgear. Minimum qualifications H.N.C. Applications stating age, training and experience to:

Employment Manager,
Johnson & Phillips Ltd.,
Charlton, London S.E.7.
(B 352)

LONDON ELECTRICITY BOARD
SHOWROOM ASSISTANTS

APPLICATIONS are invited for positions as Showroom Assistants in the Hackney and Islington areas of the Board's Northern District.

Sales experience, particularly in connection with domestic electrical appliances, an advantage.

Salary within range £490/£740 p.a. inclusive, according to age, experience and qualifications.

Apply in writing to the Manager, at 18-24 Lower Clapton Rd, London E.5, quoting ref.: PER/GC/2897/T. (B 324)

CENTRAL ELECTRICITY GENERATING BOARD
South Thames Division
LITTLEBROOK POWER STATION
OPERATING FOREMAN (SHIFT)
Vacancy No. 186/61.

THE successful applicant will be responsible to the Assistant Charge Engineer for shift work duties relating to boiler and turbine operation. Applicants should have had power station shift operation experience, preferably in both boiler and turbine houses and have had experience in the control of labour.

Salary: N.J.I.C. Schedule E, Grade 1, £1,035 per annum, including London and shift allowances. Good conditions and holidays; sick pay and optional superannuation schemes; canteen and sports and social club facilities.

Applications giving age, details of experience, etc., should be sent to the Station Superintendent, Littlebrook Power Station, nr. Dartford, Kent, to arrive by 12 July. (B 317)

LONDON ELECTRICITY BOARD
ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's South Eastern District at 44 Powis St, Woolwich, S.E.18.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, £1,090 per annum, rising to £1,215 per annum, inclusive of London Allowance.

Applications stating age, qualifications and experience should be sent direct to the Manager, South Eastern District, 44 Powis St, S.E.18, within 14 days of the publication date of this notice. Please quote ref.: PER/V/3312/T. (B 325)

Leading Domestic Appliance Manufacturer requires a

CHIEF DESIGNER -F.H.P. MOTORS

Sound qualifications and extensive design experience applicable to a range of Domestic Appliances essential.

Salary and conditions are highly attractive and assistance with accommodation will be given.

Please write fully to:- Box No. 8355 ELECTRICAL TIMES

(B 353)

J. & P.

TRANSFORMER DESIGN ENGINEER

for a tour of 12 months in S. Africa.

Johnson and Phillips wish to engage a senior power transformer design engineer with experience embracing units up to 88 kV rating, for their new transformer factory situated about 12 miles from Johannesburg. The successful applicant will be engaged for a tour of duty of approximately 12 months at favourable terms with passage paid both ways. This is a unique opportunity for a qualified man to spend a short period overseas and might interest a man recently retired or a younger man wishing to widen his experience. Interviews can be arranged with the Managing Director of Johnson & Phillips S. Africa (Pty.) Ltd., who is now in London. Applications, which will be treated in strict confidence, should, in the first instance, be addressed to the Director and General Manager, Johnson and Phillips Ltd., Charlton, London, S.E.7. (B 358)

W. H. ALLEN SONS & CO. LTD.

have a vacancy for a

SALES ESTIMATING AND CONTRACTS ENGINEER

in their

ELECTRICAL DEPARTMENT

Candidates should be between 25-35 years old and possess at least an H.N.C. in Electrical Engineering or equivalent. The work will cover proposals involving A.C. and D.C. generators and motors, Switchgear and Control gear for Land and/or Marine applications. Previous experience is desirable but not essential. Salary according to experience and qualifications.

Application forms, etc., can be obtained from:

THE PERSONNEL MANAGER
(Ref. 507/2)
Queens Engineering Works
Bedford (B 253)

BRUSH

BRUSH ELECTRICAL ENGINEERING COMPANY LTD.
(A member of the Hawker Siddeley Group)

We have a vacancy for a

SWITCHGEAR ERECTOR CABLE JOINTER

on our Outside Erection Staff. Applicants must have good experience of jointing cables up to 33 kV and should be prepared to assist on outside switchgear erection. The working area covers the British Isles and applicants must have a clean current driving licence.
Applications should be sent to:

MR. A. GARNER,
BRUSH ELECTRICAL ENGINEERING CO. LTD.,
Loughborough, Leics.
Quoting Reference: PL.9954.

(B 298)

ELECTRICAL ENGINEER

Engineering concern has vacant position for an electrical engineer for product development work, particularly on F.H.P. motors.

Preference will be given to electrical engineers with a five-year apprenticeship, aged 25/35 with minimum technical qualifications H.N.C.

Post will carry salary commensurate with qualifications and experience required.

Apply to:

Managing Director,
SINGER ENGINEERING CO. LTD.,
CLYDEBANK.

(B 348)

SALES ESTIMATOR

We are seeking for our Birmingham Sales Office a Sales Estimator, over 25, of H.N.C. standard and having experience with H.T. and L.T. switchgear.

The working conditions are particularly good, the offices being situated on the south side of Birmingham, off Hagley Rd, in surroundings that could not be more pleasant. Other advantages include non-contributory pension scheme.

Applicants are invited to write, call or telephone (BIR 4562):

The Personnel Manager,
George Ellison Limited,
Wellhead Lane,
Perry Barr
Birmingham 22B

(B 364)

COLVILLES LTD.

Ravenscraig Steel Works, Motherwell.

SENIOR ELECTRICAL ENGINEER MAINTENANCE

Applications are invited for the above position in the new Steelmaking and Strip Rolling Plant due to commission in 1961/62.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or equivalent and have extensive experience in heavy plant maintenance. It would be a particular advantage to have strip mill experience.

The position is superannuated and salary will be by agreement in accordance with qualifications and experience.

Applications in writing, giving age, qualifications and career in detail, should be sent to:

The General Manager,
Colvilles Ltd.,
Ravenscraig Steel Works,
Motherwell.

(B 354)

ENGLISH ELECTRIC • STAFFORD

CONTROL ENGINEERS

The continued expansion of large sectors of the British industry depends on the right electrical control equipment being available. There is an ever-increasing demand for this equipment and the Company requires control engineers to undertake the design of control schemes for heavy industrial processes, particularly for drive systems in the steel industry.

The work involves the design of detailed control schemes for a wide variety of processes and is mainly associated with closed loop control systems using magnetic and transistor amplifiers. Development work covers the design of static switching schemes—using magnetic and transistor elements—for complex automatic control systems. Successful applicants will be joining a leading team of engineers in this field and the work will appeal particularly to young engineers between the ages of 25 and 30, who enjoy meeting people and selling technical ideas, while at the same time doing a job requiring high technical ability. Many projects involve travelling to various parts of the United Kingdom or overseas.

Minimum qualifications required are Graduate Membership of I.E.E. or I.Mech.E.

We also have a number of vacancies for Junior Engineers, who are in the process of obtaining H.N.C. or graduate qualifications, who wish to specialise in this type of work. Training or limited experience in the heavy electrical industry is desirable, but a keen interest in control engineering is the main requirement.

Write giving full details of age, qualifications and experience to Dept. G.P.S., Engish Electric Hse, Strand, London W.C.2, quoting reference ET. 1218.Q.

(B 351)

SOUTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER
(PROTECTION AND CONTROL)
SOMERSET GROUP (TAUNTON)

SALARY within Class J, Grade 9, Salary Scale 9, £1,115/£1,245 per annum, of Schedule A of the N.J.B. Agreement.

Applicants should have experience of relay and protection testing, network grading, commissioning and routine testing of 33 kV substations, fault level calculations and fault localising and 33 kV system control.

The successful candidate will be required to undertake standby duties.

The possession of the Higher National Certificate in Electrical Engineering or its equivalent is desirable.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the Group Administrative Officer, South Western Electricity Board, Priorswood Rd, Taunton. Closing date for receipt of completed applications is 22 July, 1961.

THIRD ASSISTANT ENGINEER
(PLANNING)
SOMERSET GROUP (TAUNTON)

Salary within Class J, Grade 10, Salary Scale 8, £1,040/£1,165 per annum. of the N.J.B. Agreement.

The successful candidate will be required to assist generally in the Group Engineering Department, including assistance with the planning, preparation and examination of schemes for reinforcement of and extensions to the overhead and underground network up to and including 33 kV.

The possession of the Higher National Certificate in Electrical Engineering or its equivalent is desirable.

Applications to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the Group Administrative Officer, South Western Electricity Board, Priorswood Rd, Taunton. Closing date for receipt of completed applications is 22 July, 1961.

THIRD ASSISTANT DISTRICT ENGINEER
TAUNTON
OUTPOSTED AT BRIDGWATER

Salary within Class H, Grade 9, Salary Scale 8, £1,040/£1,165 per annum, of the N.J.B. Agreement.

The successful candidate will be outposted at Bridgwater and will be responsible for the supervision of construction works both underground and overhead up to and including 33 kV and the installation of equipment in substations under the outposted Engineer in Charge at Bridgwater. The candidate appointed will be required to undertake standby duties on a rota basis. Duties will normally be in the Bridgwater area, but the successful candidate may be required to work anywhere within the Taunton District.

The possession of the Higher National Certificate in Electrical Engineering or its equivalent is desirable and the ability to drive a car will be an advantage.

Applications to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, The Parade, Taunton. Closing date for receipt of completed applications is 22 July, 1961.

GENERAL ASSISTANT DISTRICT ENGINEERS
(DRAWING OFFICE) (2)
BRISTOL

Salary within Class K, Grade 13, Salary Scale 6, £890/£1,015 per annum, of the N.J.B. Agreement.

Applicants should have experience in a Distribution Drawing Office and be able to undertake, under supervision, duties which include estimating distribution schemes and preparation of associated drawings, and system networks and diagrams.

Candidates should possess the Ordinary National Certificate in Electrical Engineering.

Applications to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date

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for receipt of completed applications is 22 July, 1961.

DEMONSTRATOR
PLYMOUTH DISTRICT

Salary within Grade 1, £600/£700 per annum, of the N.J.C. Agreement.

Duties will include the demonstration of cooking and other electrical apparatus in Service Centres, and consumers' premises, and advising on the selection and use of such apparatus. The successful candidate will also be required to undertake duties with exhibitions, shows, etc., including evening demonstrations for Women's Institutes and similar organisations.

Candidates should be of good general education, have some experience of public speaking and should hold a recognised Domestic Science qualification with preferably the E.A.W. Electrical Housecraft Certificate. Possession of a current driving licence will be an advantage.

Applications to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Elliott Rd, Prince Rock, Plymouth. Closing date for receipt of completed applications is 22 July, 1961. (B 366)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 219/ET/61.

APPLICATIONS are invited for the superannuable N.J.B. appointment of

STATION SHIFT CONTROL ENGINEER

Tir John Power Station, Port Tennant, Swansea.

Salary: Schedule A, Class H, Grade 10, Scale 7, £965/£1,090 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C., or equivalent qualifications and have operating experience in a modern power station.

Opportunities will be given for further operational experience.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 17 July, 1961. (B 333)

THE SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following posts:

Monmouthshire and Mid-Wales Area

GENERAL ASSISTANT ENGINEER
NEWPORT DISTRICT

The duties of this post will be of a general nature and preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Salary: N.J.B. Class H, Grade 7, Scale 10, £1,190/£1,325 per annum.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to W. E. Richardson, M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Rd, Cwmbran, Mon, to arrive not later than 22 July, 1961.

Please quote reference SV/83/61/ET, endorsing envelope "General Assistant Engineer."

Swansea and West Central Area

GENERAL ASSISTANT ENGINEER
PORT TALBOT DISTRICT

The duties of this post will be of a general nature and preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Salary: N.J.B. Class H, Grade 11, Scale 6, £890/£1,015 per annum.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Fforestfach, Swansea, Glam, to arrive not later than 22 July, 1961.

Please quote reference SV/84/61/ET, endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(B 320)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

THIRD ASSISTANT ENGINEER
Vacancy Notice: ET/AV/66/61.

REQUIRED in the Taunton District of the Divisional Electrical Department.

Superannuation Scheme. Salary: N.J.B. Class AX, Grade 8, Scale 10, £1,130/£1,325 per annum.

Applicants should have had a wide experience in the maintenance of 132 kV and 275 kV overhead lines and substations and be familiar with the work associated with the commissioning of new plant. An interest and some experience in the maintenance and commissioning of protective gear would be an advantage.

Qualifications leading to Associate Membership of an appropriate engineering institution would be an advantage.

Closing date: 17 July, 1961.

ASSISTANT SHIFT CHARGE ENGINEER
Vacancy Notice: ET/AV/67/61.

Required at Hayle Power Station, Cornwall.

Superannuation Scheme. Salary: N.J.B., Class F, Grade 9, Scale 6, £890/£1,015 per annum, plus 10% Shift Allowance (minimum £90).

Applicants should possess good technical qualifications and have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Closing date: 15 July, 1961.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned to him. (B 323)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

RESEARCH AND DEVELOPMENT
DEPARTMENT CHEMIST

APPLICATIONS are invited for the appointment of a Chemist in the Service Section Laboratory of the Regional Research and Development Department of the North Eastern and Yorkshire Region, with headquarters at Leeds.

The Service Section is engaged in finding quick solutions to problems associated with generation and transmission of electricity and also short-term research investigations directly associated with plant operation. These research investigations cover such fields as boiler deposits, flue gas corrosion, feed water treatment and ion exchange resin examination.

Candidates should possess honours degree or equivalent and should have had some experience in the operation and control of boiler plant.

The salary for the appointment will be on a scale within the range £1,350/£1,720 per annum.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 21 July, 1961. (B 332)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

ELECTRICAL ENGINEER'S DEPARTMENT
THIRD ASSISTANT ENGINEER
(SYSTEM DESIGN AND PLANNING)
DIVISIONAL HEADQUARTERS, KINGSTON
Vacancy No. 135A/61.

CANDIDATES must possess the Higher National Certificate in Electrical Engineering or equivalent qualification leading to graduate membership of the Institution of Electrical Engineers. An interest in and some experience of system design, load flow and fault current calculations, including the use of a.c. and d.c. network analysers, is essential.

N.J.B. salary within the range £1,180/£1,670 per annum, including London Allowance, according to qualifications and experience.

Applications giving age, details of experience, qualifications, present position, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 26 July, 1961. (B 335)

RHODESIA AND NYASALAND

Federal Power Board

OPERATIONS DEPARTMENT VACANCY
CONTROL CENTRE ENGINEER

APPLICATIONS are invited for the above appointment at the Board's System Control Centre situated at Sherwood about 17 miles north of Que Que, Southern Rhodesia. The interconnected system to be controlled consists of 900 miles of 330 kV transmission connecting certain existing thermal stations with the Kariba Hydro-Electric Station. Total interconnected generating capacity is over 1,000 MW.

Applicants should have had experience in the operation of an interconnected high voltage system and preferably experience in Power Station operation. Qualifications leading to Associate Membership of the Institution of Electrical Engineers are desirable. The successful candidate will be responsible for the operation of the Board's interconnected system, including switching, load dispatching and associated duties. The salary for this appointment will be within the range £1,800 x £75—£2,025 per annum, plus 10% shift allowance depending on qualifications and experience.

The successful candidate will be required to contribute to the Board's Pension Fund and to join the medical aid fund, and he will be provided with a three-bedroomed house and hard furniture at a low rental at Que Que where there is a full range of Government Schools. Transport between Que Que and Sherwood is provided by the Board.

The reasonable travelling and removal expenses of the successful candidate and his family to Que Que will be paid by the Board.

Applications giving name, age, marital status and full details of education, training, experience and qualifications should be posted to reach the Secretary, Federal Power Board, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 29 July, 1961.

Full details of current cost-of-living, local taxation and climatic conditions are available from the Office of the High Commissioner of Rhodesia and Nyasaland, Rhodesia Hse, 429 Strand, London. (B 328)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

APPLICATIONS are invited for the following superannuable appointments:

(1) FIRST ASSISTANT DISTRICT ENGINEER
RUTHERGLEN DISTRICT

Candidates should preferably be corporate members of the Institution of Electrical Engineers or should hold equivalent qualifications. They should have had a sound engineering training with subsequent experience in the maintenance and operation of H.V. and L.V. Switchgear together with experience in H.V. and L.V. fault location, and be conversant with the preparation of load flow diagrams, voltage drop and short circuit calculations. They should also have had some experience in overhead line work.

Salary: N.J.B. Class H, Grade 4 (Scale 13), £1,440/£1,610 per annum.

(2) SECOND ASSISTANT DISTRICT ENGINEER
MOTHERWELL DISTRICT

Candidates should have had sound engineering and technical training, with qualifications leading to corporate membership of the Institution of Electrical Engineers. They should have had experience with the maintenance and operation of H.V. and L.V. overhead and underground networks, and substations on a large distribution system. They should also be conversant with load flow diagrams, voltage drop, and short circuit calculations, and should have had experience with H.V. fault location.

Salary: N.J.B. Class G, Grade 7 (Scale 9), £1115/£1245 per annum.

The successful applicants will require to reside within a reasonable distance of the respective District Offices.

Application forms which can be obtained from the Area Manager, Montrose Crescent, Hamilton, should be returned within 14 days of the date of this advertisement. (B 359)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 221/ER/61.
Our Ref.: 149/8 PG/MJ.

APPLICATIONS are invited for the superannuable N.J.B. appointment of

ASSISTANT SHIFT CHARGE ENGINEER

Tir John Power Station, Swansea.

Salary: Class H, Grade 9, Scale 8 (£1,040/£1,165 per annum), plus 10% shift allowance.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

Special application forms are obtainable from Divisional Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 17 July, 1961. (B 336)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 220/ET/61.

APPLICATIONS are invited for the appointment of

ASSISTANT SHIFT CONTROL ENGINEER

at Uskmouth "A" and "B" Power Stations, West Nash, nr. Newport, Mon.

Salary: Schedule A, Class M, Grade 12, Scale 9, £1,115/£1,245, plus 10% shift allowance.

Applicants should possess H.N.C. or equivalent qualifications and have had experience in a modern power station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 17 July, 1961. (B 334)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

OPERATION SUPERINTENDENT

REQUIRED at Ocker Hill Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.5, £1,275/£1,410 per annum.

Applicants should have received a sound technical and practical training, and should have considerable experience in the operation and maintenance problems arising in a large modern power station. The possession of a recognised technical qualification will be an advantage.

Apply, quoting Vacancy No. 177/61MD, on form AE6, available from the Station Superintendent, Ocker Hill Power Station, Bayley's La, Ocker Hill, Tipton, Staffs, by 17 July, 1961. (B 330)

ASSISTANT ELECTRICAL ENGINEERS with at least H.N.C. and two to three years' experience of E.H.V. transmission work required by Consulting Engineers in their Contracts and Design Department, Weybridge. Applications stating age, qualifications, experience and salary required to Kennedy and Donkin, 12 Caxton St, London S.W.1, quoting ref.: RWMc. (B 277)

ARMATURE WINDER required with experience of machines up to 100 h.p. Ideal opportunity for young skilled man to establish a permanent position and gain further experience. Apply in writing, giving age, experience, and present wages to Works Employment Officer, Fuller Electric Ltd., Fulbourne Rd, Walthamstow, E.17. (B 251)

BRITISH Engine Boiler and Electrical Insurance Co. Ltd., Longridge Hse, Manchester 4. ELECTRICAL SURVEYOR required. Permanent position carrying progressive salary scale £825/£1,225 with non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (B 341)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House Sardinia Street, London, W.C.2

CONSULTING Engineeer requires JUNIOR ELECTRICAL ENGINEER/DRAUGHTSMAN to work on design of internal installation work on new industrial and commercial projects. Good salary paid in accordance with experience in this field. Write stating age, experience, technical background and salary required to G. H. Buckle and Partners, 2 Harrington Gdns, London S.W.7. (B 356)

CABLE CONTRACTS ENGINEERS with experience installations to at least 33 kV. Must be prepared to travel anywhere in U.K. Apply giving details of work carried out to Contracts Manager, ENFIELD-STANDARD POWER CABLES LTD., Stockingswater La, Brimsdown. HOWard 2468. (B 343)

CABLE JOINTER required by Scottish Contractor. Must be experienced up to at least 33 kV and trained in one of the leading cable manufacturer's jointing schools. Able to train and supervise jointers and assist in cable contract and cable laying. Good annual salary and superannuation staff appointment. Apply in confidence, giving full details of training to Box No. 8347, Electrical Times. (B 274)

CABLE ESTIMATOR required. State age and experience.—Wandleside Cable Works Ltd., 106 Garratt La, Wandsworth, S.W.18. (B 151)

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EDITORIAL ASSISTANT for Journal of The Institution of Electrical Engineers. Engineering or Science degree and some engineering experience necessary. Journalistic knowledge desirable, but those with literary ability would be considered. Good prospects for advancement. Pension scheme. Age about 30. Comm. salary of the order of £1,000, plus or minus an amount to be determined according to qualifications and experience. Apply Secretary, I.E.E., Savoy Pl, W.C.2. (B 344)

HONG KONG. Merchant Company require qualified ENGINEER for Sales Department dealing in general Electrical and Mechanical Engineering supplies, including air-conditioning plants, refrigerators, cables, motors, pumps, etc. B.Sc. or A.M.I.E.E. preferred. and sound commercial experience. Age 30/35. Good salary, plus commission, excellent prospects. Write Box No. 2036, c/o Abbotts, Eastcheap, London E.C.3. (B 342)

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PATENTS

NOTICE is hereby given that Harold Adolph Stickel seeks leave to amend the Complete Specification of the Application for Letters Patent No. 867,721 for an invention entitled "Improvements in or relating to switching devices."

Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3774, dated 14 June, 1961.

Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 36 at the Patent Office, 25 Southampton Bldgs, London W.C.2, on or before 14 July, 1961. (B 347)

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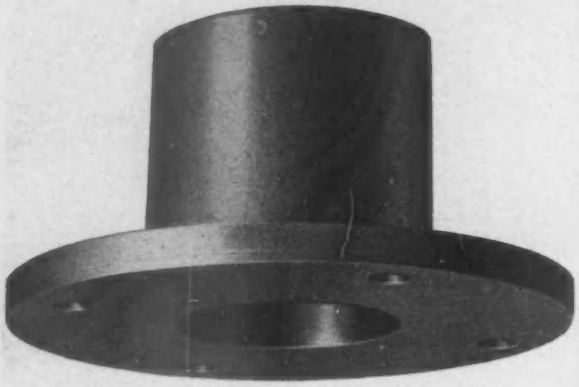

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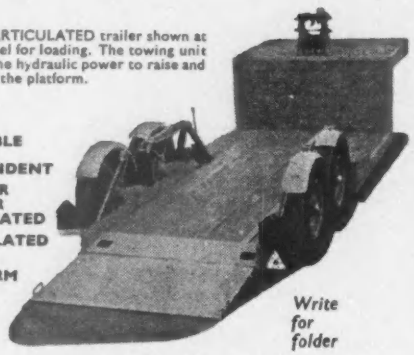

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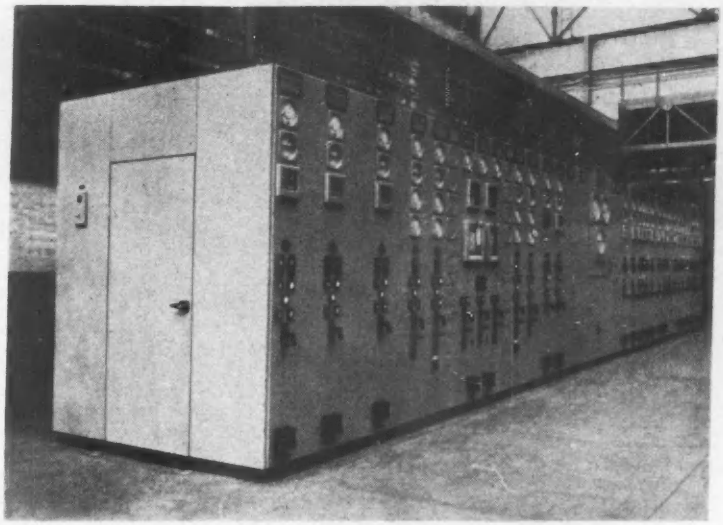

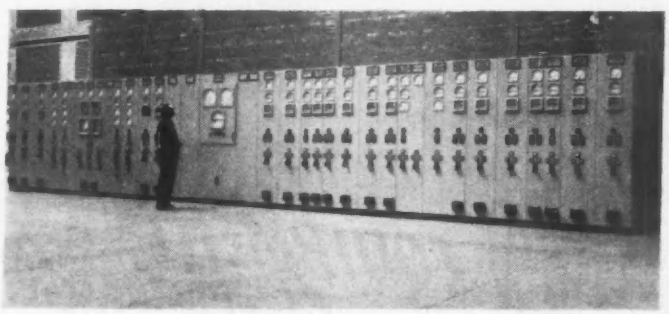

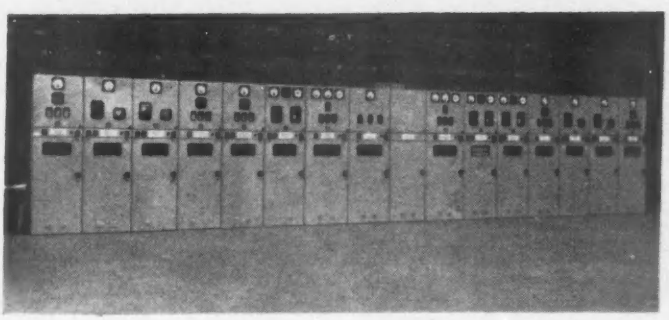

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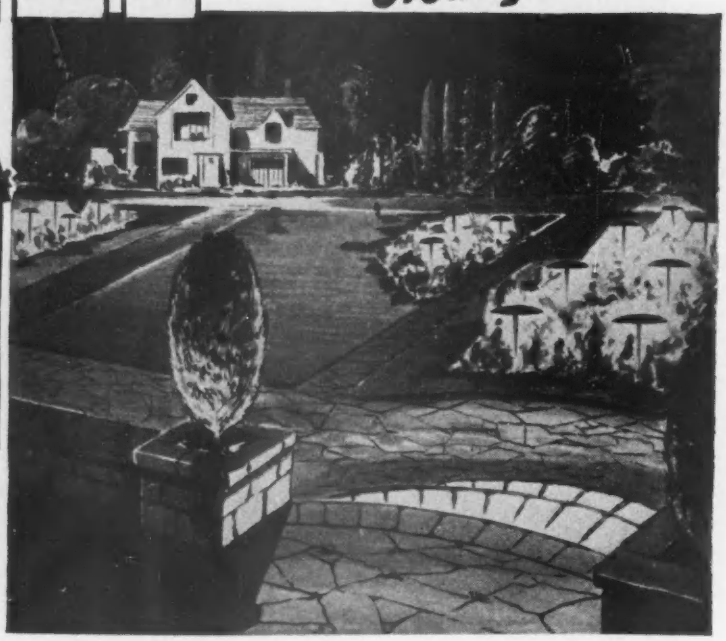

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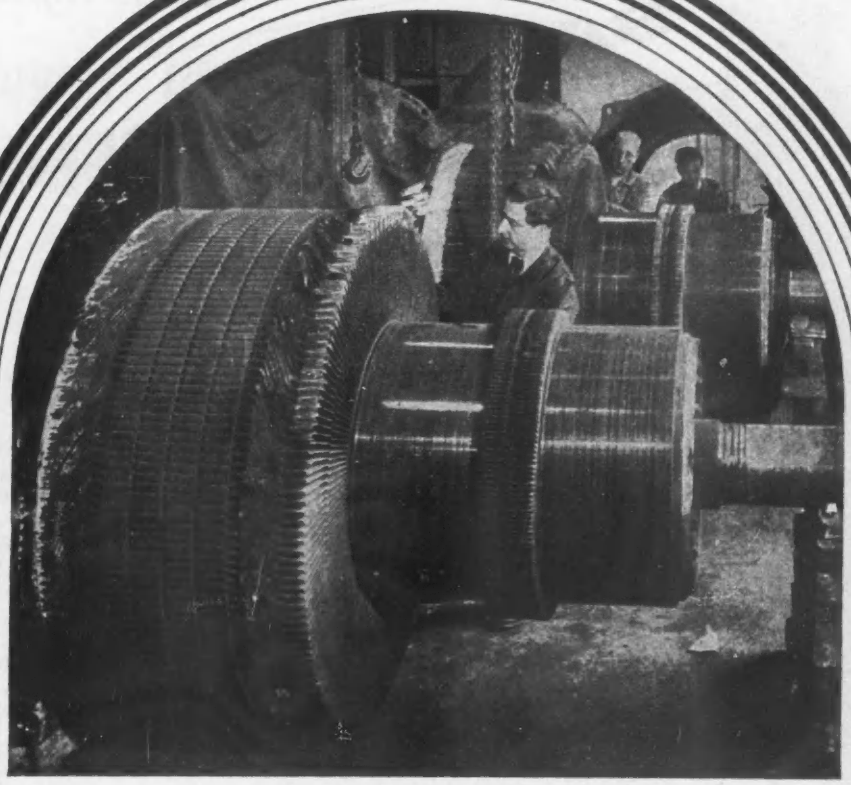

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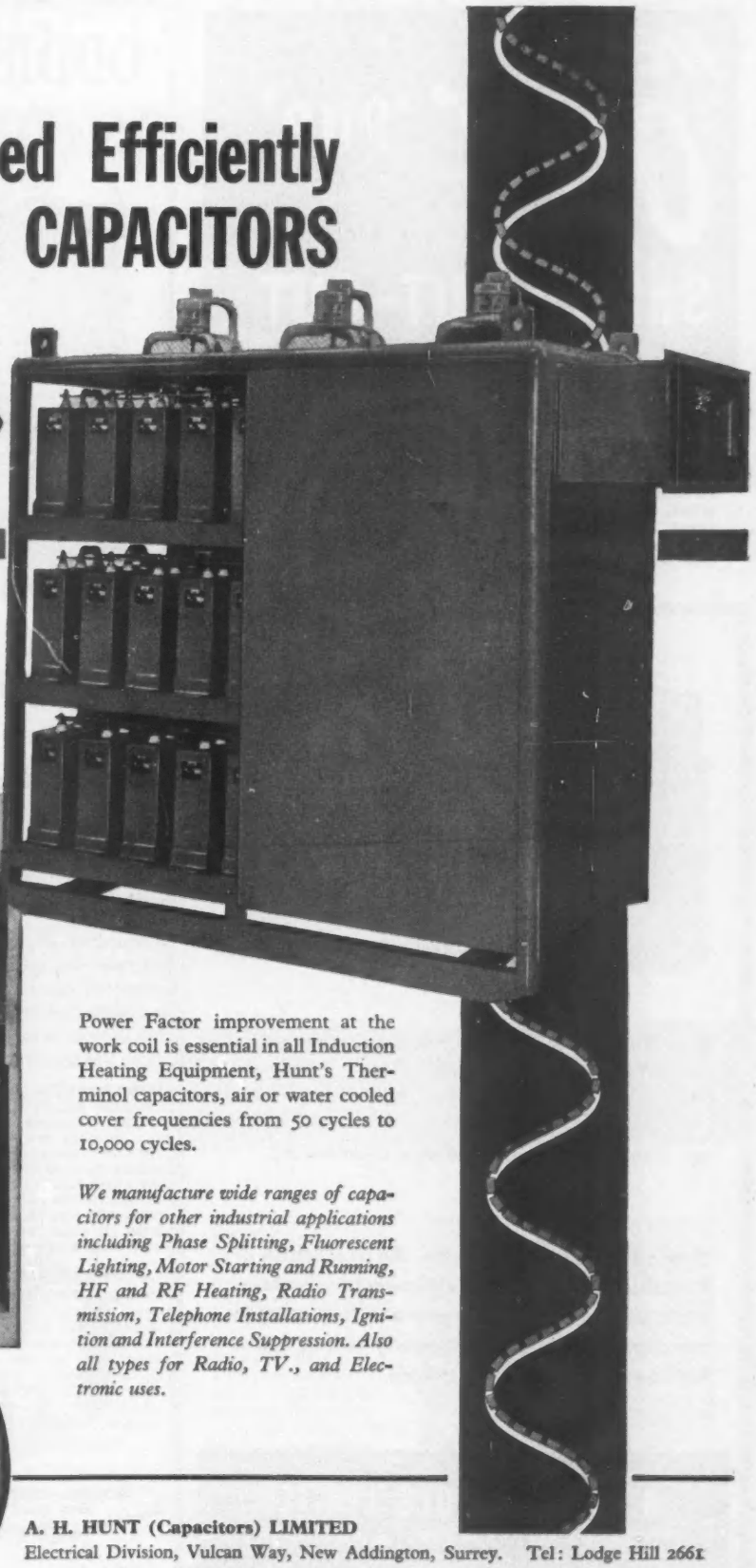

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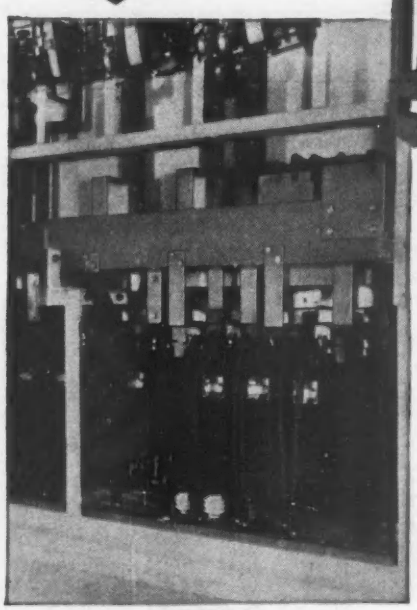

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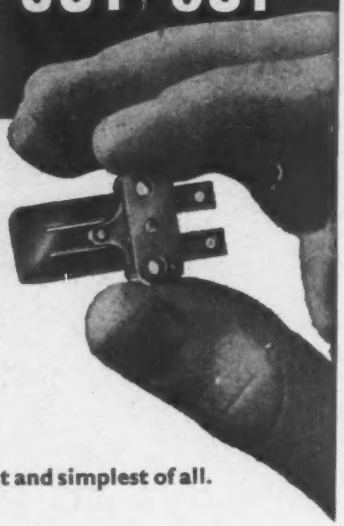

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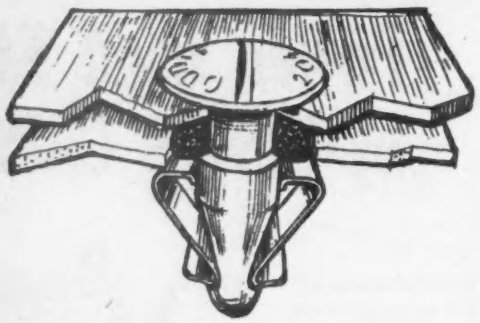

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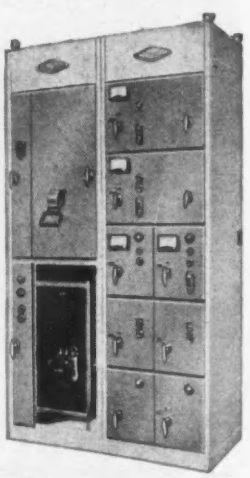

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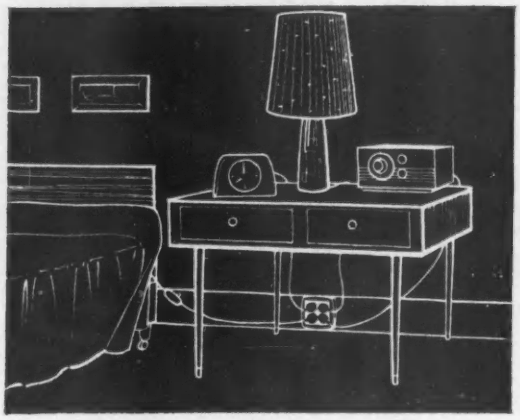

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To meet these requirements M.E.M. offer the bedside and fireside socket outlets, the latter bringing together BS 1363 and BS 546 outlets in a most useful combination. It is thus possible to provide three or four socket outlets from one point yet the overall size of the new units (4″ x 3½″) is only slightly larger than a single 13 amp socket outlet. A surface pattress enables the conversion of any already installed single 13 amp flush socket outlet to a three or four gang surface unit in a few minutes, at the cost of little more than an adaptor, and with no disturbance to existing wiring.

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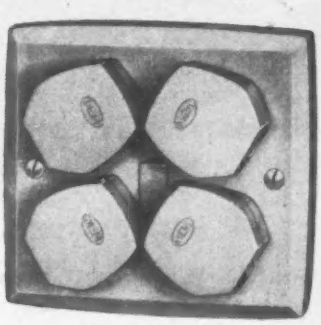
FIRESIDE SOCKET OUTLET

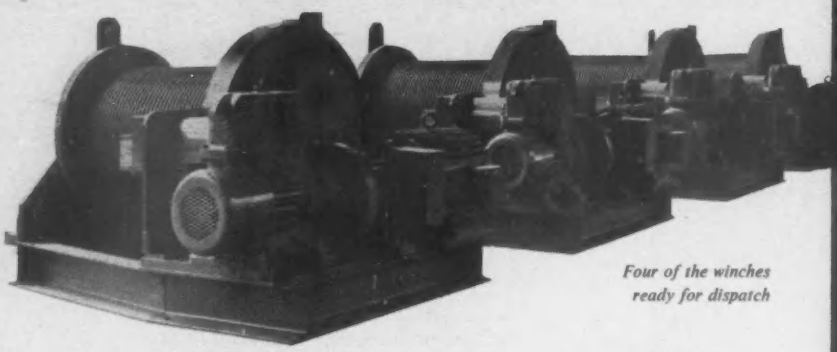
It consists of one 13 amp 3 pin BS 1363 outlet and two 2 amp 3 pin BS 546 outlets, the latter being protected collectively by a 5 amp BS 646 cartridge fuse-link which is housed in a self-ejecting carrier mounted on the front plate.

BEDSIDE SOCKET OUTLET

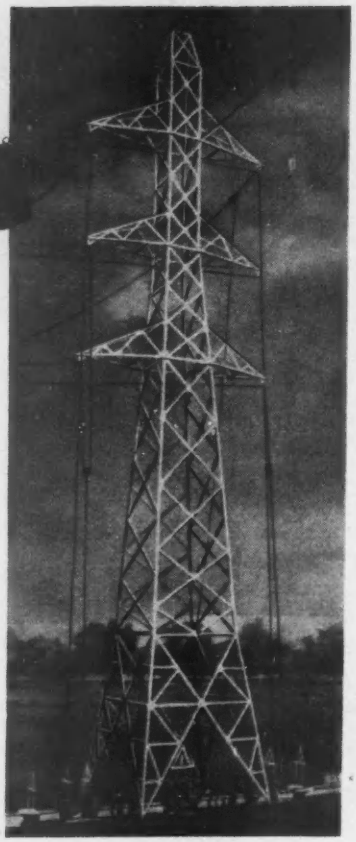
The bedside unit comprises four 2 amp 3 pin BS 546 outlets protected collectively by 5 amp BS 646 cartridge fuse-link which is housed in self-ejecting carrier mounted on the front plate. An unfused pattern is also available.



For the supreme test



Four of the winches ready for dispatch



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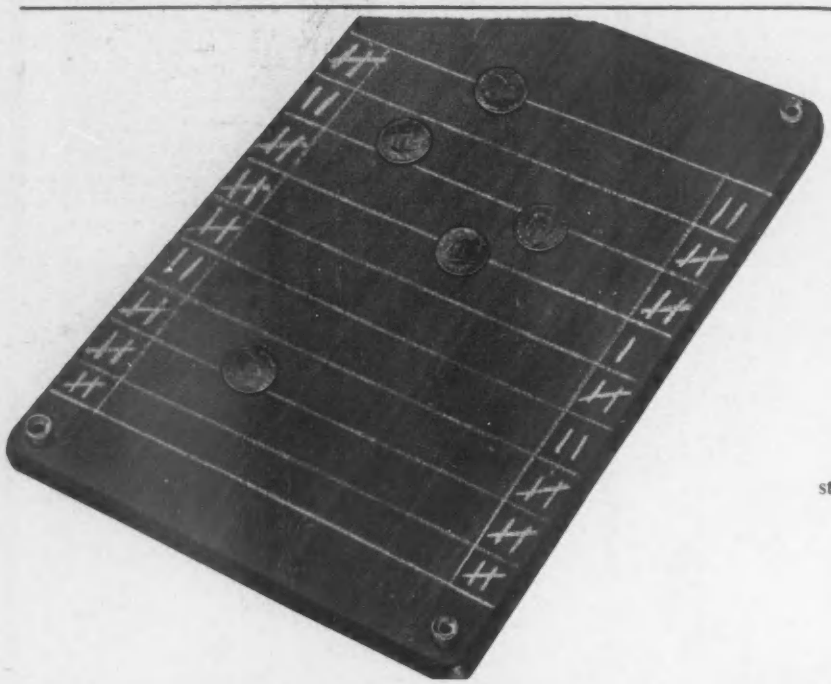

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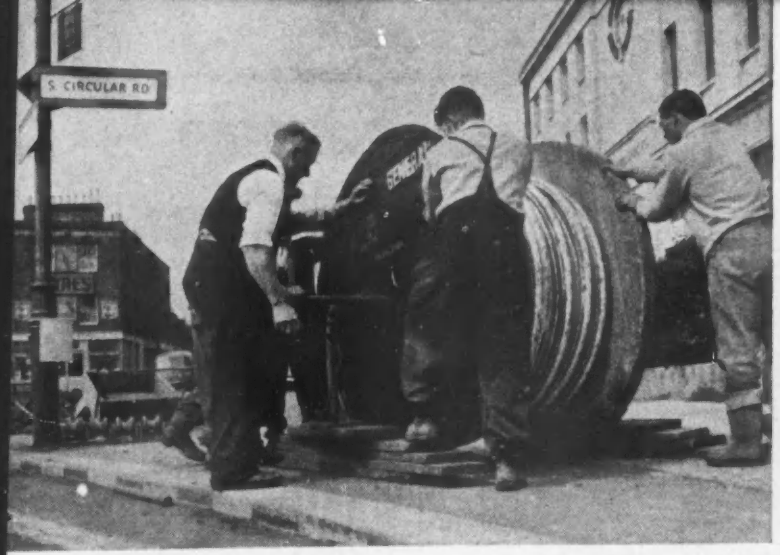

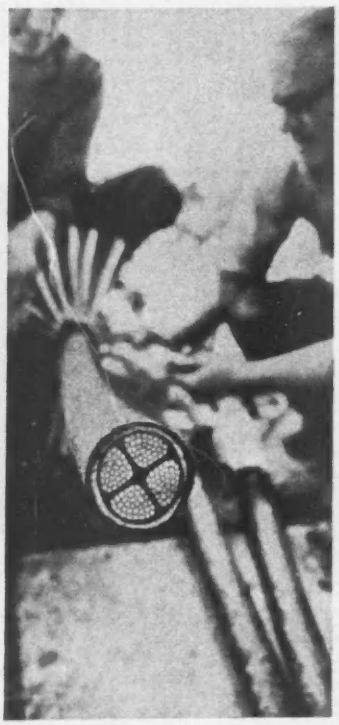

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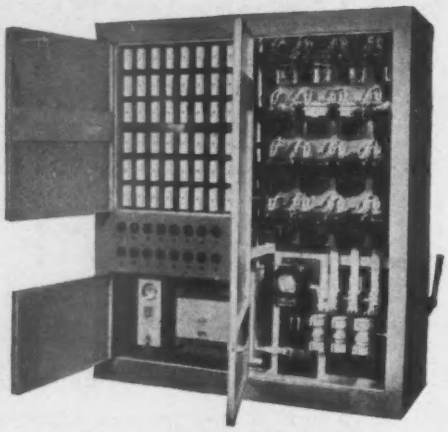

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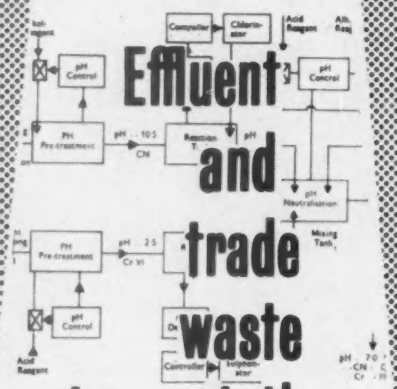

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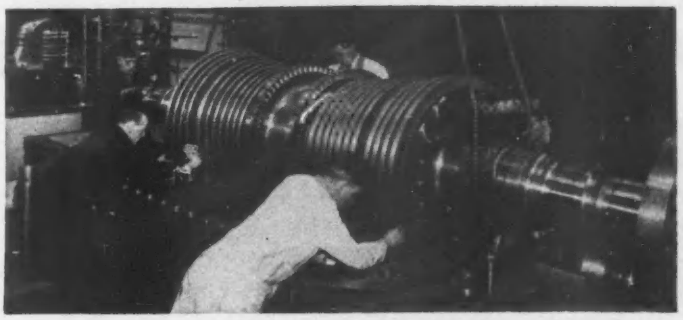
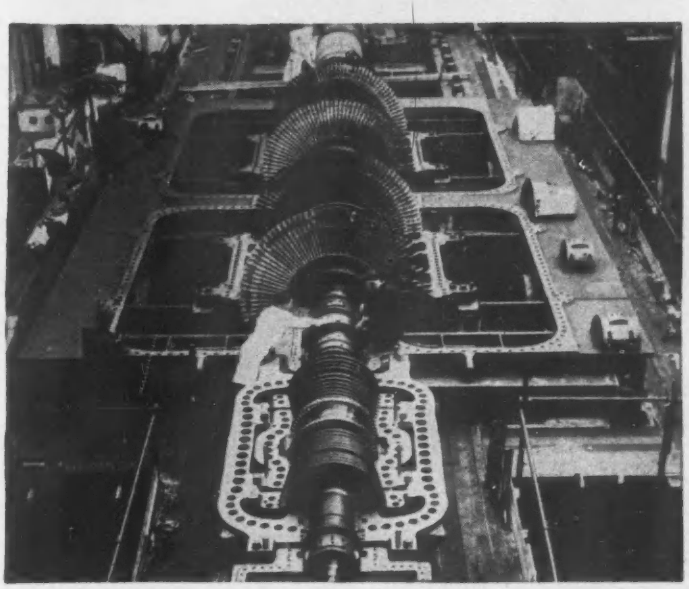


TOP — H.P. turbine erection

CENTRE — H.P. line assembly

BOTTOM — Generator stator winding



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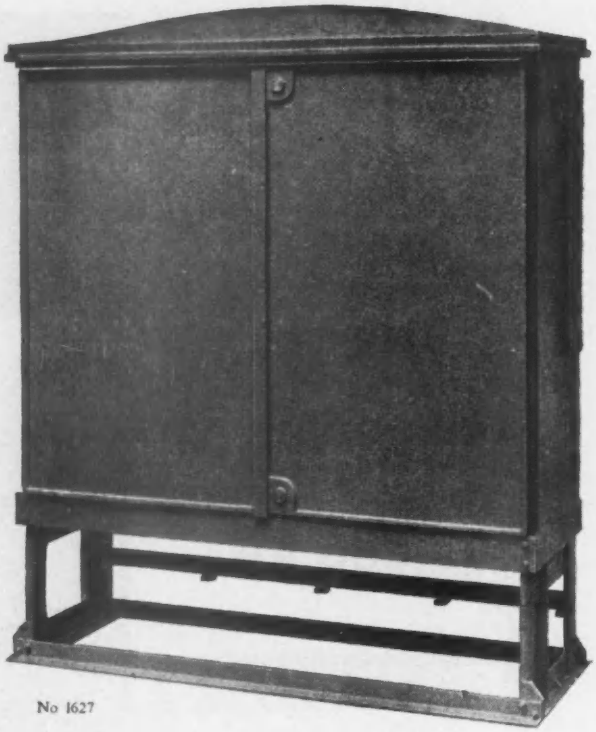

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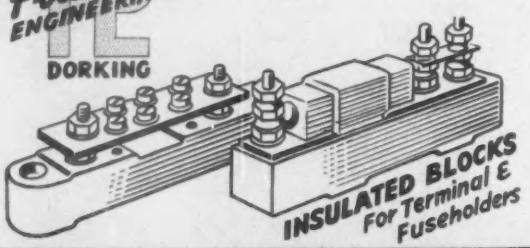

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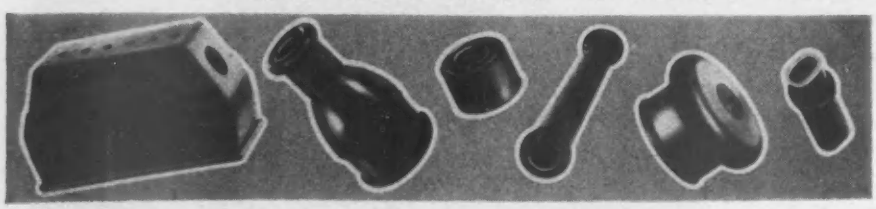

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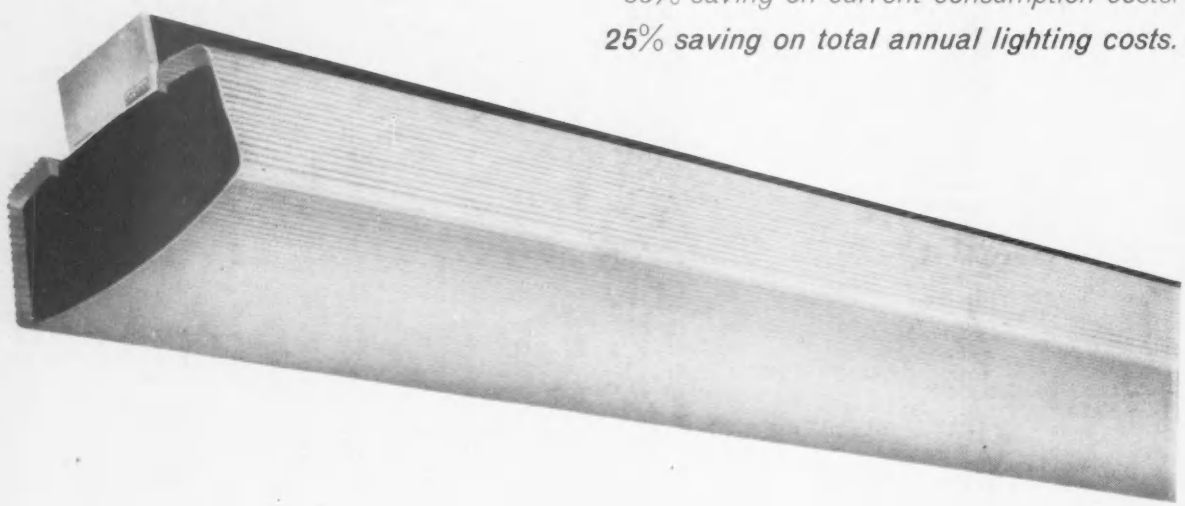

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